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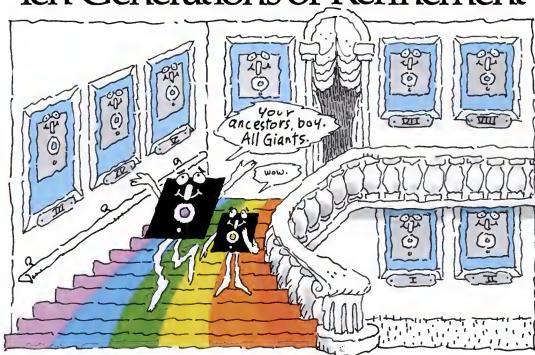
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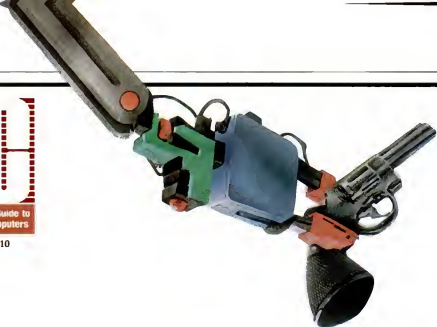
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In This Issue

COVER STORY

- The Tale Of The Mouse** 66
Paul Somerson
It's ready to give your PC a hand.
- VisiOn, A Mouse On The Digital Desktop** 74
Ron Jeffries
The first shot of a software revolution?

SOFTWARE

- Personal Finance Programs For The PC/ Corey Sandler** 90
Three for your money . . .
- Five Financial Programs For The Home/ Steven Yoder and Sherry Knight** 106
. . . and five more to bank on.
- Eight General Ledgers For Small Business/ Steven Yoder and Sherry Knight** 136
Accounting for your small business.
- Expanding Your Printer's Horizons/ Corey Sandler** 175
Sideways is what Sideways does.
- Five C Language Compilers/ Hanno Hinsch** 210
With utilities that go beyond BASIC.
- The Dedication Of MultiMate/ Corey Sandler** 233
A Wang-like word processor for the PC.
- Getting More Out Of VisiCalc/ Frank J. Derfler, Jr.** 287
Utilities, templates, and advice.

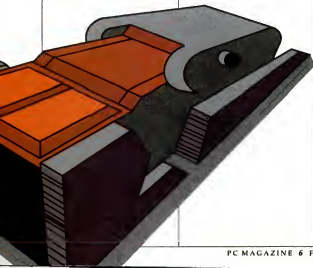
- Graph 'n' Calc Puts Numbers Into Shape/ Amanda Hixson** 303
A visual tool for numerous applications.
- What Is (The) Answer?/ Mark Phillips** 333
A new data base manager is questioned.

HARDWARE

- Hard Disks Made Easy/ Winn Rosch** 269
Removable cartridge Winchester arrive.

PROGRAMMING

- Kaleidoscope/ B. Boasso** 183
A colorful divertimento you can try.





How To Build 367
Computer Maze/
Greg Estes
 program listing for a
 graphics game.

ARCADE

he Organization 194
lan Meets Pac-Man/Lindsey
an Gelder and Corey
andler
 ig business, shoot-em-ups,
 id snackers.

LEGAL

ading Secrets/ 169
aniel Remer
 un you keep an idea under
 ck and key?

FINANCE

Making Tax 274
Write-offs Your Business/
Barry R. Steiner
 A best-selling tax consultant's
 advice to PC owners.

IBM EYE

Anatomy Of A 316
Colossus, Part II/Kathleen
Burton
 What part does the Personal
 Computer play in IBM's
 history?

EDUCATION

How To Start 346
A User Group/Rumona
Landsberg
 Hard-earned knowledge from
 IBM specialists.

PC FICTION

EPICAC/Kurt 393
Vonnegut, Jr.
 A novelist's vision of a poetic
 computer.

BOOK EXCERPT

Games, Hypergames 403
And Metagames/Joseph
Deken
 Playtime in *The Electronic*
Cottage.



COVER

Illustration by Joann Daley

READER'S TURN

Quest For 372
The Ideal Language/
Michael Ham
 A nomination from a PC user.

DEPARTMENTS

From The Editor's Screen 19
Letters To PC 31
To All From Ahl 45
PC-Communiques 53
PC Tutor 61
Club News 359
PC: Bluebook 427
User-To-User 449
Zero Base Thinking 452
New On The Market 454
Index To Advertisers 476
Coming Up 479
Wish List 480

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UTILITIES I, II	53
CROSSTALK	117

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Microsoft CROSSTALK	117

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G-Bar Charts
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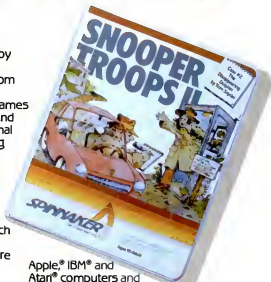
Where can you find educational games that your kids will really enjoy playing?

Elementary, my dear Watson. From Spinnaker.

Our Snooper Troops detective games are fun, exciting and challenging. And best of all, they have real educational value. So while your kids are having fun, they're learning.

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The Snooper Troops programs are compatible with



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Snooper Troops detective games help your children learn to take notes, draw maps, organize and classify information and they help develop vocabulary and reasoning skills. All while your kids are having a good time.

So if you want to find educational games that are really fun, here's a clue: Snooper Troops games are available at your local software store, or by writing to: Spinnaker Software, 215 First Street, Cambridge, MA 02142.



Spinnaker's early learning games will help make your children as smart as you tell everyone they are.



Your kids are pretty smart. After all, they're your kids.

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Spinnaker games make the computer screen come to life with full color graphics and sound. And they're fun. Lots of fun. But they also have real educational value.

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And we're introducing new games all the time.

So look for Spinnaker games at your local software retailer, or by writing to: Spinnaker Software, 215 First St., Cambridge, MA 02142. And show your kids how smart their parents really are.



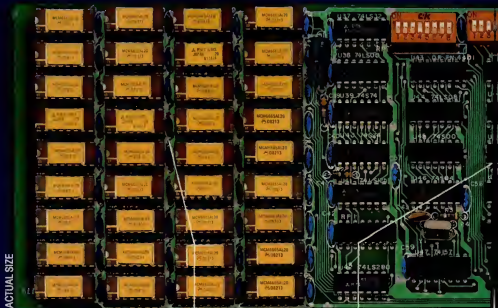
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Now you can utilize all the PC's capacity with Quadram's extremely flexible configurations. And it's totally compatible with IBM hardware, operating systems, and high level languages. It's a full-size board that can be inserted into any free system slot and it even includes a card edge guide for securely mounting the card in place.

SOFTWARE TOO!

With Quadboard you receive not only hardware but extensive software at no extra cost. Diagnostics, utilities, and Quad-RAM drive software for simulating a floppy drive in memory (a super-fast SOLID STATE DISK!) are all part of the Quadboard package.

\$595

with 64K
Installed



PARALLEL PRINTER I/O.

A 16 pin header on Quadboard is used for inserting a short cable containing a standard DB25 connector. The connector is then mounted in the knock-out hole located in the center of the PC backplane. The parallel port can be switch disabled or addressed as Printer 1 or 2. No conflict exists with the standard parallel port on the Monochrome board. The internal cable, connector and hardware are all included.

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Using the same chip as that on the IBM ASYNC board, the device is software programmable for baud rate, character, stop, and parity bits. A male DB25 connector located on the back connector is identical to that on the IBM Async Adapter. The adapter is used for connecting modems, printers (many letter quality printers require RS232), and other serial devices. Switches allow the port to be configured as COM1 or COM2 and the board fully supports IBM Communications Software.

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Someday Is Here

Was there a time when you thought software was a comfortable pair of jeans? And disks were something Dick Clerk spun on "American Bandstand"? Or how about computers? They were those huge, unapproachable multi-million dollar masses of whirling tape drives, fleshing lights, and mountains of punched cards?

It was all not so long ago.

Now you have on your desk—or coffee table—a personal computer: a speedy, powerful device that costs only thousands, but has even more capacity than the behemoths from the ancient age of the 60s and 70s.

And you hold in your hand the latest issue of PC, a monthly book (just ask your tired mailman whether he considers it a mere magazine) that covers this entire field.

The pioneers of the personal computer marketplace were companies like Apple and Tandy, Ohio Scientific and Altair. IBM, as you may have learned by reading the first installment of our three-part "Anatomy of a Colossus" series (which began last month and continues in this issue) sat back and watched for many years. When IBM finally entered the market at the end of 1981, it was with a mature, competent computer with a strong emphasis on professionalism.

To some observers, IBM's arrival legitimized the market. But the fact was that the IBM Personal Computer was a marvelous idea searching for a reason. Everyone agreed that Big Blue had produced a fantastic little beige machine. But there was essentially no software for it to run, and IBM's list of hardware accessories barely filled one side of a double-spaced typewritten page.

Someday, we were told, the little IBM just might amount to something big.

Perhaps, we might say modestly, a



glimpse of the future was revealed when PC Magazine arrived in February 1982 with an ambitious 96-page premiere issue. Almost all the articles in that first issue spoke of the great expectations and hopes for innovative software, hardware, and applications. But, I think it's fair to say that few of our early writers or readers could have envisioned that by the fifth issue (the PC Product Guide), the magazine would have grown to 408 pages, and that by the eighth issue the printers would be straining to produce a 472-page tome. They were still counting and recounting the pages for this issue as I write these words.

Today IBM is doing just fine, thank you. Very few people outside the company know exactly how many Personal Computers IBM has produced, but the guesses range well up into six figures. The next round of IBM microcomputers is

expected to build on that base and push into markets of sophisticates as well as novices. The manufacturers of the IBM "clones" are gearing up to battle for a share of the market as well.

Here at PC, success in terms of numbers is already at hand. Circulation and advertising are increasing with every issue. We added a Reader Service Card last month, and the responses are pouring in; this month even more information, including "New on the Market" listings, is available to readers.

On the editorial side, we're very proud of the contents of this month's "book," and we're excited about the stories in the pipeline for issues to come. Judging by the response from our readers at shows and in the mail, we think we have an audience that awaits our efforts with great anticipation.

Our goal is to make PC as professional



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ScratchPad with a hard disk, for example, allows in excess of 20,000 entries! NEVER see those disastrous OUT OF MEMORY messages again.

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"In our opinion ScratchPad is an excellent business-oriented spreadsheet program, easy to learn, easy to use, and well documented."

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Japanese Distributor: ASR Corporation International, 3-23-8, Nishi-Shimbashi, Minato-Ku, Tokyo 105, Japan. Tel. (03)-437571 Telex: 0242-2723.

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*Additional memory recommended for optimal performance of all features.

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as the computers we are writing about, with articles that concentrate on how to use your personal computer at work and home, how to select hardware and software, and how to take full advantage of the Personal Computer's potential.

PC Magozine is an essential peripheral to IBM Personal Computer owners, and to those considering such a purchase. Our emphasis will be on editorial excellence. The change, and the challenge, is to make PC better as we get bigger.

I think it is time to announce that "someday is here."

This issue marks the unofficial IBM debut of California's second-most famous rodent: the computer mouse. (Mickey and Minnie's first-born, "Micro"?)

Ronald Jeffries, a California computer consultant, offers a sneak preview of VisiCorp's VisiOn software package for the IBM PC. VisiOn uses an electronic mouse to transmit hand movements to the computer, bypassing the keyboard. It is, to some observers, a giant step toward the ultimate personal computer. Paul Somerson, an officer of the New York City PC Users Group (NYPC), reports on the background of the mouse, and its implications for computer users.

The most common first uses for personal computers are word processing, financial planning and business, and home bookkeeping. In this issue we're pleased to present reviews of eight home finance programs that can keep track of everything from allowance money to mortgage amortization; reviews of General Ledger software for small businesses; another in a timely series of tax tip articles, this one by best-selling author Berry Raymond Steiner; reviews of a capable new word processor and a promising data base manager; and much, much more.

Novelist Kurt Vonnegut contributes a short story entitled "EPICAC," a bit of whimsy about a computer that decides to stop thinking about war and begins writing poetry instead.

Is there something missing from this list? Is there a story you'd like to see in PC? Do you have a special interest or application for an IBM Personal Computer? We'd like to hear from you—you can help us keep our promise.

—Corey Sandler

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WordPlus-PC was designed and written by Andres Escallon.

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connectors and brackets on the parallel removable battery†; soft-time and date automatically; software which allows printing to background task; SpeedDisk software memory to simulate an ultra disk; PAL (Programmable

*The parallel port can be addressed as LPT1/LPT2, the serial port can be addressed as COM1/COM2. Both can be jumper disabled. They fully support IBM software.

†The removable battery has an estimated 1-year life. No soldering needed for replacement.

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NAME DESCRIPTION

1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Break-even analysis
7 DEPRSL	Straightline depreciation
8 DEPRSD	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDOB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDOVAL	Value of a bond
30 DEPLETTE	Depletion analysis
31 BLACKSCH	Black Scholes options analysis
32 STOCKVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDOVAL2	Value of a bond
35 EPIEST	Estimate of future earnings per share for company
36 BETALNPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model: what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRNF	Value of perfect information
43 VALADNF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EQQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUGQ	Fixed quantity economic order quantity model
53 FQECWASH	As above but with shortages permitted
54 FQECQCB	As above but with quantity price breaks
55 QUEUECB	Cost benefit waiting line analysis
56 NCFANAL	Net cash flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPCI	Cap Asset Pt. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMBAL	True rate on loan with compensating bal required
61 DISCBAL	True rate on discounted loan
62 MERCANAL	Merge analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FURPRF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLK	Computes weeks total hours from timeclock info
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOCE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TWISAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELPR	Computes selling price for given after tax amount
88 ARBICOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPROF	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCOMBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage/valuation program

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Letters To PC

Investor Upgrades

Thank you for your review of *The Personal Investor* (PC, Volume 1 Number 7), which I thought was fair and accurate. However, the reviewer was not aware that *The Personal Investor* has been upgraded to manage and automatically collect quotations on options, bonds, mutual funds, and Treasury bills. It will also manage short sells of stocks or options, and will write a list of all purchases in the DIF format. This format is readable by *VisiCalc* and other programs, allowing an investor to create his own portfolio analysis.

Richard S. Parker
President
PBL Corporation
Wayzata, Minnesota

Moonlighter's Serenade

I enjoy your magazine. The most important thing you do is review software packages. I would like to see articles on careers as a free-lance consultant or programmer. What are the pitfalls? What are the best strategies for developing such careers? As a PC user I find a crying need for knowledgeable help. Do you plan such an article? I'm sure many of your readers would be interested.

Lynn Cochrane
Norwood, Massachusetts

Sounds good to us. We're putting something together for a future issue. Free-lancers with interesting stories should drop us a note. See "Colling All Writers" at the end of "Letters To PC"—Ed.

Caveat Emptor

In shopping for my IBM PC, I came up with some guidelines to help prevent others from being taken.

Your dealer may offer a single price for a common hardware configuration and charge extra for additional items needed. Make certain the dealer hasn't included the same item in the system

fee and in the additional fees.

Double check to be sure the dealer has passed along all the price reductions announced by the manufacturers.



Check this by comparing the prices quoted against the dealer's written price sheet.

A dealer may try to charge dealer preparation fees to remove optional equipment you didn't want in the first place. It is unreasonable to be charged \$75 or more to remove an unwanted disk or unneeded RAM.

Every time I went to a showroom, I saw great set-ups and had urges to purchase a fancier system than I had planned. If I had bought the first configuration a salesperson showed me, I would have paid roughly twice as much as I ended up paying and would have had a system unsuited to my needs. It is best to decide on the options needed while far away from the showroom floor. Arrive at the dealership on the day of your big purchase with everything already decided.

Plan to shop at more than one dealership. Prices and services can vary significantly. Make sure you're well prepared

and don't allow yourself to be rushed into a purchase.

Mark Barnett
Portland, Oregon

PC, Volume 1 Number 7, included a letter by James Berry, in which he complained about misleading advertising by software firms. My own recent experiences indicate that similar tactics are used by hardware manufacturers, including IBM.

When I decided early in November to purchase my own IBM PC, I had already spent considerable energy researching the configuration that would best suit my needs and my pocketbook. This meant starting with the basic 16K system unit and installing the other components myself. Since IBM had advertised the 16K system in numerous magazines and on television, I expected no problems—at least not from IBM.

WRONG!

According to ComputerLand, Sears, and the IBM Product Centers, for such a money-saving system I could expect a 4- to 6-month delivery date. Since then, the estimate has been increased to 6- to 12-months. But if I cared to order a "standard" configuration for \$2,405, I could have my computer in 2 days.

IBM has made the 16K unit practically impossible to purchase, while steering potential buyers to a standard off-the-shelf system costing nearly twice as much. By playing a high-tech version of "bait-and-switch," this corporate giant bears a closer resemblance to a snake-oil dealer than an industry leader.

Ulrich Heilke
Northridge, California

Check that CHKDSK

After purchasing a copy of *Dbase II* from my local dealer I was unable to boot up the demo for a trial before breaking the seal on the system disk for acceptance.

Three weeks later, after numerous

phone calls to the dealer and no satisfaction, as well as several calls to the Ashton Tete office in Culver City with the same result, I decided to run a CHKDSK on the demo, which produced the message, "disk not initialized." It was a blank disk! That was not the end of the foul-ups, but made me a little wiser for the future. Running CHKDSK on every newly purchased disk would have saved weeks of frustration over how to boot up something that wasn't there!

D.K. Maclean
Alameda, California

Student Teaching

You missed the mark in your review of Vocab Teacher (PC, Volume 1 Number 8). It's not primarily for teachers, and the student can select any lesson for study. Vocab Teacher allows a student to create his own lesson. The student enters the list; then the computer tirelessly drills him, gives him hints if he doesn't know the lesson, asks him to go over words that were missed the first time through, and finally gives him a score. It's an excellent learning tool that the student can tailor to his own requirements.

Peter Williamson
Wilton, Connecticut

A Matter of Choice

I don't understand what Jim Edlin was trying to say in his Zero Base Thinking article in PC, Volume 1 Number 7. In particular, he attacks the idea of local networks by calling them a "distraction." He appears to be unhappy that present technology prevents sending of data over telephone lines at the multi-megabit rates achievable over short distances. I agree that life can be disappointing at times.

The fact is that local networks are a wise choice for specific applications, such as office automation or process control. In an environment where you don't need long distance communications but do need high data rates and support for many users, a 10 mbps local network makes more sense than 300 or 1,200 bps modem connections.

I'd like to see Mr. Edlin try to convince a large corporation that it should

move data around its office by sending disks from one user to another. He could then sell the virtues of punched, paper tape as a preferable medium, since rigid-disk storage is technologically limited to finite capacities and access times.

The area of data communications is tough enough for most people to understand and work with. We don't need an ivory-tower thinker who offers contrasts between personal computers and hallucinogens to add to the confusion.

Ed Sawicki
Lake Oswego, Oregon

Easywriter and the NEC 3550

In his "Users Guide to Printers" (PC, Volume 1 Number 7), Denny Goodman writes that he is still having trouble making the NEC 3550 print bidirectionally while doubling spacing. It's really very easy. All you have to do is change the Vertical Motion Index (VMI) from the default of six lines per inch to three lines per inch. This is accomplished by using escape code A. For double spacing, the code would be: Esc A Alt 16 Esc 2 (with no spaces between characters). The Alt 16 sets the VMI at 16/48 inch, or three lines to the inch. You can also attain other spacing choices.

I have found the NEC 3550 particularly easy to use with Easywriter 1.1, which I have already used to write a book. To include the Escape codes or Alternate characters, you must initiate each sequence with Ctrl 0 or Alt 15, either of which is supershift, or "shift in." Thus, the entire sequence for bidirectional double spacing would be: Ctrl 0 Esc A Ctrl 0 Alt 16 Ctrl 0 Esc 2.

With this approach, you must halve the number of lines per page, and the number of lines of print per page. The software will treat the double spacing as a single space.

I have heard a number of disparaging remarks about IBM's recommended combination of the NEC 3550 and Easywriter 1.1. However, my experience has been that, with the codes built into the 3550, this is a powerful and very flexible combination. Through the user codes, I am able to produce underlining and boldface with a single keystroke, as well as all kinds of fancy formatting.

Incidentally, superscripts and sub-

scripts are accomplished very easily with Easywriter 1.1 and the 3550. Again, you use Ctrl 0 to access the escape codes, and then "Esc" for a half line feed, and "Esc;" for a negative half line feed.

The only shortcoming in Easywriter 1.1 is that it lacks documentation for the NEC 3550. It does not require any reconfiguration, however. Furthermore, with Ctrl 0 or Alt 15, you can work with all the 3550 codes, and use the full capability of the machine.

Leonard M. Kaplan
Brooklyn, New York

Patching Up WordStar

We were pleased that the article by Danny Goodman, "The PC Gets WordStar" (PC, Volume 1 Number 7) addressed the use of the user patch area for controlling the Epson printer.

However, the procedures outlined in Figure 3 (Installation of special print features) relate to WordStar Version 3.02, which has been obsolete for several months and has been replaced by MicroPro with its Version 3.2.

Our program's response to step #6 is as follows:

0485: 0757 02-00 00 00 00 00 00 00 00
0485: 0760 00 00 00 00 01 08 00-00 00 00

Ignoring the instruction not to proceed if our values were different from those shown, we proceeded with the steps and were unsuccessful in producing the nonstandard print styles. Our dealer, ComputerLand, suggested we get in touch with PC for a correction. Can you help?

Patricia Stirling
Laguna Beach, California

A procedure to use with WordStar 3.2 appeared in PC's "User-To-User" column, Volume 1 Number 9—Ed.

MicroPro Woes

You should be congratulated on your excellent publication. It seems as though you are one of the more honest publications dealing with personal computers. In PC, Volume 1 Number 7, you published two letters critical of the MicroPro Corporation and its handling of customer problems ("No Poison Pen" and "No Pros at MicroPro"). In that same issue, you published an interview

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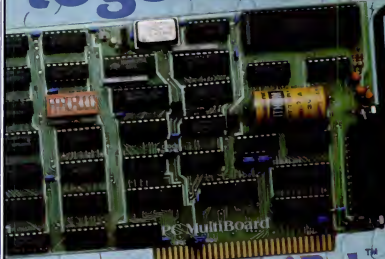
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with MicroPro's less than modest president, Seymour Rubenstein. I too am unhappy with the MicroPro Corporation and its obvious disregard for customer relations.

In October, I purchased MicroPro's new 3.2 versions of WordStar, SpellStar, and MailMerge. Although I have been very satisfied with WordStar, the other two will not function properly. I called MicroPro and was told that it did not normally handle such problems with end users, and would speak only with dealers. It agreed to make an exception in my case and return my call within the day. However, it did not return my call or my two subsequent calls.

I contacted my dealer (Fredrick Computer Products, Fredrick, Maryland) and asked that he contact MicroPro about my problem. He had little more success and was told only that SpellStar would not run in any file having eight-letter words beginning with r! MailMerge has its own supply of unaccountable quirks.

Although WordStar is an excellent word processing program, the other MicroPro packages are something of a nightmare. Perhaps MicroPro should be more concerned with debugging its products and less concerned with collecting fees for unlawful copyright infringement.

Dr. Charles R. Shear
Associate Professor of Medicine
University of Maryland
Baltimore, Maryland

Your magazine has been most helpful to us in learning about our PC and its possibilities. We hope you will be able to assist us in resolving our dilemma.

In June 1982, we purchased a PC from IBM and WordStar from ComputerLand in Bellevue, Washington. In September, after being assured that the IBM PC, WordStar (when updated), and the MicroPrism IDS 480 printer were compatible, we added the printer. In October we received the updated WordStar and discovered that the MicroPrism was not one of the printers supported. ComputerLand promised to patch the software to support this printer, but later said it would cost us another \$180 to \$240 minimum for their "help."

Calls to IDS produced a promise to help as soon as it could get the needed

information from MicroPro. IDS has called back to let us know it is still trying but has not yet gotten the information. The company the printer was purchased from has also promised help when it can get the information from MicroPro. Our calls to MicroPro have only produced an unkept promise to call back and a very large phone bill for time spent on hold.

We have been trying to resolve this for 3 months. We hope it will not become necessary to return WordStar as we have found it a very useful and enjoyable program.

J. D. Losey, M.D.
College Place, Washington

The Taxman Cometh

What happened to "What To Tell The Taxman" (Volume 1 Number 8)? This is something I can use. I searched cover to cover several times and it is nowhere to be found!

Gary F. Auclair & Family
Saratoga, California

Oops! Please see Volume 1 Number 9, page 375—Ed.

Keyboard Control

I read with great interest your recent article, "The PC's Keys" in PC, Volume 1 Number 7. Having spent considerable time with the IBM keyboard in the development of a program package, The Instructor, I also have some strong views.

Every keyboard design makes trade-offs in power, flexibility, cost, standardization with the past, human factors, ease of use, and much more. The IBM keyboard overall represents a job well done and much better than most earlier microcomputers.

I agree wholeheartedly with the shift key and lock key problems discussed in the article. The other problems are minor. In fact, IBM has moved forward in avoiding such nomenclature as calling the Enter key the Return key. (Enter is a better choice for those with no prior computer background).

I disagree with Mr. Edlin's position that the most galling omission is the lack of a true reset key. The BREAK function (Ctrl + Scroll Lock) can be used to do what he wants in BASIC programs. In fact, users of other computers

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Jo-L Hendrickson
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No Ivory Towers

Having been involved with computers since 1956, I have seen some enormous changes over the years. Some of the computers for which I wrote programs back in the fifties required programmers to know the speed that the drum memory was turning so that they could determine the correct time to read or write data on it. Fortunately, this kind of "housekeeping" now takes place in the hardware or in systems monitor programs so that you, as a user, do not have to worry about such matters.

On the other hand, dealing with machines that required you to know how all the internal registers and devices interested forced you to be very careful, very meticulous, and not infrequently, very clever. Another factor that forced a great deal of discipline and cleverness was the limited memory usually available. When I took a job with Digital Equipment Corporation in 1969, I felt a certain euphoria at having computers available with 8K and 16K instead of the 4K machines I had previously been using.

Many people getting into computers today look at these early computers and laugh, much as one laughs at a 1948 TV show on a 7-inch black-and-white screen compared to a modern show on a 19-inch color set. However, the parallel is not a good one. Why not?

The programming techniques developed in the fifties and sixties were, as I noted, generally efficient and clever. Many of them were set down in the Proceedings of the Institute of Radio Engineers (IRE)—which later changed its name to the Institute of Electrical and Electronic Engineers (IEEE)—and in such books as Donald Knuth's *Art of Computer Programming*. Publications like these were the bibles of professional programmers back then. When a new, faster sorting routine was published, it was quickly implemented in scores of other locations.

Today, I am appalled at the vast number of people writing programs who haven't read anything beyond the manual

packaged with their system. Now, there's nothing wrong with wanting to use a new computer right away, and I certainly encourage children to get on the machine as quickly as possible. However, when I receive an article about a wonderful "new" sorting technique that runs 20 percent faster than the common bubble sort, I can't help but think, "Yes, but the Heist sort developed in 1971 is 200 percent faster than a bubble sort; why not start with that as a jumping off point for improvement?"

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PC-Communiques

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Step by Step

The most difficult challenge in robotics right now is to recreate human or animal walking patterns in a machine, allowing an automaton to enter houses and even walk up and down stairs.

"Machines That Walk," an article by Ivan Sutherland in the January 1983 *Scientific American* notes that researchers at Carnegie Mellon University in Pittsburgh are studying pictures of horses in full gallop where all four legs leave the ground at once.

Ambulatory robot prototypes are based on either one- or six-legged designs. A mechanized, computerized creature with one or six legs can be operated by a program that can pause at any point in its simulated ambulation without the robot falling over.

Nature provides many models crawling around everywhere for six-legged robots to emulate. It's difficult, though, to imagine the kinfolk of our PCs getting around on pogo sticks.

Software Pirates Beware



It's not exactly the image that IBM would like to project, but the name of the modern, bustling Florida town that gave birth to



Un Pay-Cey pour les Français?

"A PC for the French?" Speculation that IBM will begin assembling PCs somewhere in the land of Gaul intensified recently when a keen-eyed visitor to Boca Raton filed this report:

"While touring the production line, I noticed that the yellow 'high voltage' warning sticker attached to the PC power source is printed in English, German, Spanish, and Italian. 'Why not in French?' I wondered. When I mentioned this to a marketing official, he, of course, refused to comment."

This may or may not be significant. After all, the warning stickers aren't printed in Dutch. We can't, therefore, conclude that a PC plant will soon sprout on the banks of the Zuider Zee. But Dutch isn't quite the international language that French is.

Maybe "personal computer" simply doesn't translate well in French. Or maybe someone at IBM is a secret Francophobe. Or just maybe IBM is planning to open a PC facility somewhere between le Côte d'Azur and what Britain insists on calling, The "English" Channel.

In any case—and given IBM's fabled reticence—speculating on IBM's intentions is always good fun, especially when they concern le pay-cey.

the PC means "mouth of the rat" in Spanish.

Sixteenth-century Spanish pirates had to enter Boca's inland waterway in order to take cover after plundering other ships. The pirates hated the jagged rocks that made the inlets around Boca quite dangerous, and came up with the unflattering imprecation, Boca Raton. Take heed computer pirates!

Ménage à Trois

IBM is taking a keener interest in the PBX and semiconductor industries. In fact, Big Blue has started acquiring an interest in same. The computer giant has apparently become concerned about Intel's shaky financial condition, especially inasmuch as Intel is a major supplier of semiconductors for IBM computers, including of course, the PC. It wouldn't do to have Intel, or a significant part of it, fall into the clutches of a less-than-friendly competitor. Perhaps this explains IBM's recent purchase of 12 percent, or 6.25 million shares, of unregistered Intel stock for \$250 million at \$40 a share, with an option to buy 30 percent in the years ahead.

Upon issuance of the shares, IBM will own 12 percent of Intel. The agreement is subject to review under the Hart, Scott, Rodino Act.

In addition, IBM appears to be getting into office automation in a big way, having signed an agreement with Canada's telecommunications firm, Mital, to jointly develop customized switching systems based on digital PBX technology.

PC-Communiques Pays

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PC-Communique

From the Swamplands to the Highlands

An IBM spokesperson reports that the first PC production plant in Europe will be located at Grenock, Scotland. It will serve Europe and the Middle East.

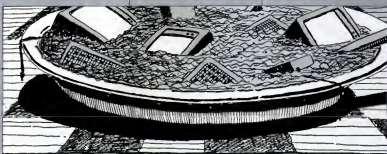
Until this production line is up and running, all PCs, whether for stateside or elsewhere, will continue to come from Boca Raton.

Watching the PC Plant Grow

The Boca Raton production plant has ten assemblers on a manual line and ten assemblers on an automated line that runs 24 hours a day, 5 days a week. It takes a PC between 4 and 6 hours to be assembled. The plant is truly more of an assembly facility than a manufacturing plant because parts are shipped there from all over the world.

A spokesman from Strategic, Inc. in San Jose, California predicts that if IBM gets the Peanut, its newest micro, up and running by the second quarter '83, it will easily ship 1 million PC units this year.

He further reports that IBM shipped 200,000 units during '82, and during '83 may ship up to 4,000 PCs a day or 90,000 a month.



Waiter, There's a Bug in my PC!

Every PC is subjected to a manual debugging phase before being shipped to market. The debugging includes a "burn-in," which, while revealing, isn't as apocalyptic as it sounds. The computers are plugged in and turned on for a specified period. Occasionally, something somewhere inside the system fails. In the parlance of the trade, this is called a "failed burn-in."

According to the manager of the PC assembly plant, most of the bugs exposed during burn-in occur on "field replaceable units" (FRUs) such as cards, disk drives, and power supplies.

He advises new PC owners to keep the packaging (box and padding) that the PC comes in. Bugs not exterminated during factory burn-in will most likely emerge within 24-hours of user run time during "house burn-in." Better keep a can of Raid handy just in case.



Let's Get Digital

It was bound to happen. If the computer can become "Man of the Year," it certainly qualifies as the subject of popular songs. Reymont Association in Florida, (Boca Raton, no less) has just released a disk—phono, not floppy—entitled, "BASIC Ain't the Language of Love."

The lyricist bills it as a saga of love in the computer age.

Gregg Brown of San Jose, California, opened last summer's US Festival with his "Video Junkie" which tells the story of a 10-year-old boy's troubled life after becoming hooked on video games.

The tale became more interesting when Brown approached Atari to share the fruit of his creative impulses. A spokesman for the company informed him that the song was "in poor taste," and warned him "not to proceed further," according to Brown.

Perhaps Atari was offended by the verse that advised, "The past-time he's developed isn't too healthy/This young man could be extremely wealthy/If he put . . . those quarters under key and lock/and invested them all in IBM stock."

Round the Collar and Off the Cuff

A PC owner in Chicago uses the PC to catalog his necktie collection. He has created a data base in which the ties are organized by color, pattern, and the number of times each one has been worn in a month. This unusual application is just one personal computer anecdote collected by John Bear of Mendocino, CA.

Bear is writing a book entitled

Computer Things I 142 Things I Wish I Had Known Before I Bought My First Computer. Bear thinks computers are "splendid" but perhaps "not quite as wonderful as most people seem to think." Computer Wine focuses on overcoming problems that have developed during the infancy of microcomputer use.

The book will be published by W. Speed Press of Berkeley, CA. If you have an anecdote about your personal computer, contact John Bear, P.O. Box 646, Mendocino, CA 95460.

"Now that my initial curiosity has been satisfied, things are not quite the same. My liaison with the computer has moved into comfortable middle age. I am looking for a warm meal on the table, for a dependable friend."

James Follows, *The Atlantic*
March 1983



8088s in the Back Forty

Homestead's Farm Management System, a program for IBM PC that includes hog, feedlot, and dairy modules, was chosen the best farm management software program by the Illinois Farm Bureau in 1982. During the day-long competition, two teams of nine farmers each reviewed 75 programs and picked Homestead's hands down over the competition.

Such arcane (to city folks) issues as row and field lines, what profits fertilizers yield by field, and commodities futures were considered when the choice was made. A spokesman for Homestead said the program "helps farmers make decisions a year ahead of time."

Writing To Read

IBM donated more than 300 personal computers and typewriters, 900 tape recorders, 2,410 sets of earphones, almost 10,000 disks, 12,885 audio cassettes, 104,410 student work journals, and 9,000 books to over 100 schools in seven states for the school year beginning September '82. "Writing To Read," IBM's experimental program for kindergartners and first graders, if successful, will begin to alter the way in which children are taught to read and write.

The program's author, Dr. John Henry Martin of Stuart, Florida, says "children begin intuitively to write," and that 5-year-olds already possess vocabularies of 2,000 to 4,000 words.



In San Francisco, Osborne reflected on the microcomputer market. "Adequacy is sufficient," he observed, "everything else is irrelevant. If you're PC-compatible, you stand a chance; if you're not, you're dead." When asked to comment on IBM's response to Apple's new Lisa computer, Osborne remarked, "I don't see IBM reacting. Why... should IBM care about Lisa?" Osborne feels that, armed with VisiCorp's VisiOn, the PC will offer the same capability as Lisa at a lower price. IBM, no doubt, would like to think so. Time will tell. Meanwhile, Peanuts anyone?

Switched-On Osborne

When Adam Osborne, founder and president of Osborne Computers, speaks, people listen. Addressing a standing-room-only crowd at the recent CP/M show

PC-Communiques

CP/M-86 Price Plunges to \$60

Digital Research (DR) announced at the CP/M'83 show in San Francisco that it will market a retail version of CP/M-86 for the IBM PC for only \$60. IBM's version of CP/M-86 had not attracted as many adherents as

DR's version is based on the more recent generic CP/M-86 version 1.1 and includes several enhancements such as a print spooler, graphics device drivers, and a GSX graphics operating system that is compatible with DR's new line of graphics software. It will be possible for programs using this version to migrate to the Concurrent system.

DR has just begun to market products for the IBM PC directly to end users. CP/M-86 will soon be available through ComputerLand, Sears Business Centers, and other IBM PC dealers.

At the show, DR also announced a wide range of other software, including languages, graphics utilities, and applications programs. These products will also be sold directly to the public in 1983 and are compatible with CP/M-86. It appears that DR may be taking steps to recreate the spiral of compatibility that made CP/M such a success in the 8-bit world.

The key question that remains is—now that CP/M-86 is available at an affordable price, will enough desirable programs be written for it to inspire PC buyers to choose it over PC-DOS?

PC-DOS, probably because its \$240 price tag did not compare favorably to the PC-DOS \$40 ticket.

A survey of retailers, quoted by Portia Isaacson of Future Computing Inc. at CP/M'83, indicated that 96.3 percent of PC systems were ordered with PC-DOS, compared to the 3.4 percent that were purchased with CP/M-86 or Concurrent CP/M-86.

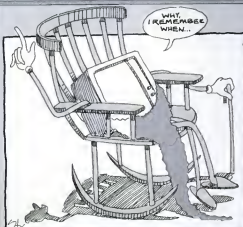
Software Meets the Malls

Ed Murphy, product manager at ComputerLand, said at the CP/M

In Lieu of Lucre

Bonuses are a treasured tradition in the history of American corporate life. They take many forms ranging from turkeys for the holidays to Caribbean getaways. This is the first time we've heard about bonus PCs, however.

Seems Intel has offered a free PC to any employee who writes and publishes three articles on certain high tech subjects, providing the articles give Intel a modicum of favorable public exposure. Which way to the personnel office?



You've Come A Long Way, Machine of the Year

In 1975 there were 4,000 microcomputers in existence, and only one computer store.

'83 conference in San Francisco that ComputerLand soon plans to open 75 satellite software stores that will only carry software products. They will be located in shopping malls and areas of high foot traffic and low overhead.

Murphy reported that the company is considering expanding its presence in the international market where it now has 150 stores.

Dialing for Disks

Microinformation Publishing in Minneapolis has a toll-free number users can call to receive information on where to locate and purchase specific applications packages for the IBM PC.

Using a data base of over 7,000 packages, Microinformation Publishing will perform this service for free. Its data base encompasses a wide range of software categories from real estate and agriculture packages to educational software—an excellent idea. The 800 number will be installed by mid-February. Until then call (612) 447-6959.

Before spending the money on the hardware, users can find out if the software they need actually exists—an excellent idea. The 800 number will be installed by mid-February. Until then call (612) 447-6959.

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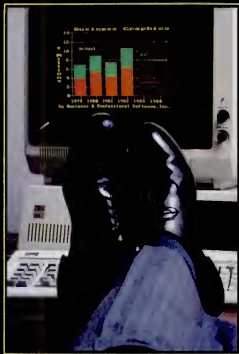
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CIRCLE 157 ON READER SERVICE CARD

PC Tutor

Clearing screen displays quickly, displaying super- and subscripts, using Intel's 8087 chip, convincing programs to make use of a RAM-disk, and using single-sided disks on a double-sided drive are some of the topics covered in this session with the PC Tutor.

Error Evasion

Q: I would like to see you address the problems I've had with the "REDO FROM START" error message. My experience with this is that the message is not trapable with an "ON ERROR" statement when I use IBM's Advanced BASIC.

Dennis Singstack
Ordville, Wisconsin

A: You are quite right. As far as I know there is no way to trap that error. The only way to avoid generating the "REDO FROM START" message is by writing a BASIC subroutine that will take a string input and then do all of the analysis to spot this message. This is not a very good solution, but it's the only one I know of. One of our readers was kind enough to send a BASIC subroutine that solved the problem by this method, but the listing is too long to include in this column.

Packing Programs

Q: Is there some way to get IBM's BPI Accounting system on one 320K disk? I have copied the programs and they all fit nicely on one double-sided disk. Selecting menu item 5, Change Diskettes, leads me to the next menu, but the program stops there. It keeps telling me to insert another disk even though we both know all the necessary programs are on the current disk.

Kit Campbell
Richardson, Texas

A: According to the DOS 1.1 manual, you should not have trouble using 320K disks with the BPI accounting packages. Read pages G-5 and G-6 at the end of your DOS



1.1 manual for detailed instructions on how to shift to double-sided drives. The best approach would be to completely reinstall the system. If this does not work, then nothing will.

Fast Times with the 8087

Q: In the December issue of PC, you mentioned that the Intel 8087 can speed up floating point arithmetic enormously. Will this chip make BASIC programs and word processing programs run faster?

Several Readers

A: The 8087 adds a number of new machine language instructions to the 8088 instruction set. If a program does not use the 8087 instructions, then having an 8087 will not be of any benefit. In particular, none of the programs now available from IBM (including BASIC and BASICA) will run any better after the installation of an 8087.

A word processing program rarely performs any floating point arithmetic. Even if a program of this type used 8087 instructions whenever possible, the time

savings would be negligible.

Floating point arithmetic is used in two primary applications. Number crunching routines, such as statistical analysis and forecasting, make much use of floating point routines. A floating point number is a number with decimals, such as 1.2 or 3.14159. Graphics routines also use floating point numbers. If an applications program draws many circles

**AT PRESENT,
not many PCs are
equipped with the
8087.**

or calculates averages, then an 8087 would decrease the execution time considerably, but only if the program was written to take advantage of the 8087 instructions.

As the 8087's price drops (the chip presently sells for about \$200), expect its instructions to be used more and more in business and graphics programs. This is the way of the law of supply and demand. At present, not many PCs are equipped with the 8087, hence few programs have been written yet that use its instructions.

One notable exception to this is in compilers and interpreters. Lifeboat Associates claims that 8087 support will be available soon for its Lattice C compiler. Also, APL*PLUS/PC, produced by STSC, Inc. of Rockville, Maryland, supports the 8087. It is likely that people who use interpreters and compilers will need to

write number crunching programs, and will use the additional power provided by an 8087. Most packaged programs, such as word processing programs, wouldn't really need that additional speed, and will probably never support the 8087 chip.

If you want to use an 8087, because you expect to do a lot of floating point arithmetic, you'll need to get a compiler/interpreter that supports the 8087, or a set of subroutines for the language of your choice that will call 8087 instructions. Micro Ware, of Kingston, Massachusetts, advertises subroutines for IBM BASIC.

IF A PROGRAM does not use the 8087 instructions, then having an 8087 will not be of any benefit.

Assembler, Pascal, and FORTRAN that will let you use an 8087 for extra speed. I have had no experience using that package of routines.

I do have an 8087 in my PC. It was installed easily just by plugging it in, and it works perfectly well with the 8088 that come with the PC. For more information, you might refer to the Intel microprocessor data book. Intel numbers the 8086/8087 pair as an iAPX 86/20 and the 8088/8087 pair as an iAPX 88/20.

Seeking Superscripts

Q: I use an IBM PC with a monochrome display adapter and Advanced BASIC. I need to generate superscripts and superscripts on the screen and printer. I have asked many knowledgeable people how to do this. Their response was that I would need to learn assembly language to construct shape tables for the superscripts. I wouldn't mind learning assembly language, but first I'd like to know what shape tables are and whether my system will have enough memory for them.

Lee Dayton, Jr.
Wilton, Connecticut

A: It sounds as if all the people you asked have worked with Apple microcomputers. The IBM PC does not use shape tables. If you use the monochrome display adapter, there is, unfortunately, no way to display superscripts and superscripts.

A shape table is a device within the Apple operating environment that allows users to construct new graphics characters by writing directions on how to draw points. The Apple's shape table is much like a machine language version of the DRAW command in BASIC. It provides a signal for the display that goes up, right, left, or down in the course of drawing a figure.

The IBM monochrome adapter relies on a character set in read-only memory (ROM) on the card; it can only generate a 25 by 80 display of characters. Although you could, perhaps, generate superscripts by changing the way the character set is drawn, the amount of work that would be required is extraordinary. After adding this minor enhancement, you would find that the 4K of display memory on the monochrome adapter card would only produce a 12 by 80 display anyway.

There are two better solutions. A number of companies sell graphics cards that are compatible with the IBM monochrome display, yet allow you to build each character using dot graphics, rather than IBM's character set method. See if

THE APPLE'S shape table is much like a machine language version of the DRAW command in BASIC.

you can find a card that is compatible with the color routines in BASIC, such as SCREEN and LINE.

An easier solution would be to use the IBM color/graphics adapter with a suitable monochrome display (not the IBM display, however). With a small amount of work, this card can be made to generate superscripts and superscripts. Unfortu-

nately, there are no word processing programs presently available that display true superscripts.

If you only require the superscripts and superscripts to be printed, you'll find that many of the commercially available word processing programs will do this well. The characters will not look quite right on

THERE ARE no word processing programs presently available that display true superscripts.

the screen, but they will be printed as very good superscripts and superscripts.

One suitable program that springs to mind is Wordix, manufactured by Emerging Technology Consultants. It will print out superscripts and superscripts for ordinary text files when requested. WordStar by MicroPro should also generate superscripts and superscripts, although I believe that the present release for the PC does not. Both programs use control characters that brocket the desired superscript text. The symbols look strange on the screen, but the printed result is fine.

Operating RAM-Disks

Q: I recently sent for and received "Electronic Disk" software from B & L Computer Consultants that emulates a disk drive in RAM. The routine sets up a "Drive C" in RAM which greatly improves the efficiency of disk oriented programs. We use EasyWriter II and EasyFiler, both of which are very slow because of their heavy dependence on disk operations. I do not know how to access the RAM's Drive C from these programs. Is there a simple BASIC program we can run prior to loading these programs that would interchange Drive C for Drive A to enable us to use the RAM's electronic disk?

William S. Hinds
Costa Mesa, California

A: I have never used EasyFiler, but EasyWriter runs under its own operating sys-

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CIRCLE 476 ON READER SERVICE CARD

tem. That is, in order to run EasyWriter you need to reboot the machine, and then EasyWriter loads its own version of DOS. Given these circumstances, there is no way to use an electronic disk (RAM-disk) with this program, because its operating system will overwrite any RAM-disk program that may have been previously loaded.

A RAM-disk intercepts all of the lower level operating system calls (interrupt 19) that ask for a disk operation, and reroutes calls that pertain to the RAM drive. RAM-disk programs load just above the operating system. Rebooting the system by typing Ctrl-Alt-Del automatically wipes out the RAM-disk program, and any files that were on RAM-disk may be lost.

In fact, the RAM-disk manufactured by B & L allows you to reboot without losing the RAM-disk, but you must use its specially modified operating system and call the disk program immediately. I doubt that this would work with EasyWriter.

By the way, the B & L RAM disk program you own has a major bug. You may experience the problem of some programs using up all available storage and overwriting your RAM-disk. If you can, you

REBOOTING
the system
automatically wipes
out the RAM-disk
program.

should return the software and attempt to find a more reliable program.

If I can assume that EasyWriter uses its own DOS, the same way EasyWriter does, I think you will find it impossible to use a RAM-disk with it. In the future, you'll do well to avoid buying programs that need to modify the operating system or that use their own operating system. They will give you nothing but trouble when a new version of DOS arrives.

Screen Clearing

Q: I would like a nice simple way to clear part of the screen in BASIC. The problem

with writing a bunch of **LOCATE** and **PRINT** commands is that they run too slowly. Is there a way to call a machine language routine to do this?

Roger Hopkins
Rochester, New York

A: There is a machine language routine you can call from BASIC. It is effective, but not very simple. It calls the BIOS video routine (interrupt 16) that scrolls up any portion of the screen. For more information on this routine, refer to page A-44 of the IBM Personal Computer Technical Reference Manual.

A BASIC program (see Figure 1) will clear the screen in a rectangular area based at (R1,C1) and (R2,C2). The values given in this program will clear the entire screen. The program is split into four blocks. The first block (lines 10 through 60) sets up an array A% containing the assembler code that will be executed to clear the screen. The next block (lines 110-140) assigns row and column values and then calls the subroutine that begins in line 1000. The third block (line 900) contains only an END statement to end the program. The subroutine call occupies lines 1000-1020.

Double Drives and Single Sides

Q: Is it possible to use single-sided disks in a double-sided drive? Are there any possible incompatibilities that will get in

the way of producing single-sided disks using the double-sided drive?

Several Readers

A: The physical media, the magnetic disk, used for a single-sided or a double-sided disk is completely indistinguishable. The only difference between the two is that side 1 of a double-sided disk has been checked out and is guaranteed to function. You can use a single-sided disk in a double-sided drive and a double-sided disk in a single-sided drive.

The difference between single-sided and double-sided drives lies in the number of heads. A double-sided drive has two heads, one for each side of the disk, facing each other. A single-sided drive has only one head; usually a piece of felt is on the other side where the second head would be. This means that a double-sided disk on a double-sided drive has twice the storage capacity of a system with a single-sided disk or drive. A double-sided drive also needs some extra circuitry to operate the second head, so you cannot simply install another head in a single-sided drive to double its capacity.

Very often all or part of side 1 of even a single-sided disk will be usable. This does not mean that you should use the second side. It may work fine for a while, but the magnetic coating might not be as uniform or reliable as the coating on side 1 of a double-sided disk. When you run DISKCOPY and FORMAT on a double-sided drive without selecting the single-

sided option /1, the routines find whether or not the disk has a usable second side by trying to read track 0 of side 1. If this succeeds, the disk is deemed to be double-sided.

This procedure often causes problems with double-sided drives. If a single-sided

A DOUBLE-SIDED drive needs some extra circuitry to operate the second head.

ed disk has a working track 0 on side 1, even though most of the other tracks are not good, the FORMAT routine still will attempt to format the side. The result will be a double-sided disk with a number of bad tracks that will be reported when FORMAT finishes. The bad tracks will be obvious during operation, because when FORMAT comes to a bad track, it will reseek track 0 and then try the bad track three times. This disk process is quite noisy; what's more annoying is that it uses marginal tracks that may do things to your data that you will later regret.

When DISKCOPY detects a readable track 0 on side 1, it displays the message "Copying 2 side(s)." and will proceed to copy both sides of the disk. In general, that is a reasonable approach, except for one problem. When you run FORMAT, even with the single-sided option (FORMAT B:1), it will format track 0 of side 1. This means that DISKCOPY will detect that track 0 is readable, but that none of the other tracks on side 1 have been formatted. The result is that DISKCOPY will report many read errors. If you use a single-sided disk in a double-sided drive, always select the /1 option when you run DISKCOPY (DISKCOPY A: B:1) to get around that problem.

What happens after the disk is formatted? When FORMAT is run with the single-sided option or on a single-sided drive, it sets a flag to tell the operating system that the disk is single-sided. The flag is a group of 6 bytes at the beginning of the file allocation table found on sectors 2 and 3 of track 0. These bytes are set

Figure 1: A BASIC program to clear a rectangular area on the screen.

```
10 DIM A%(22):REM reserve for code string
20 REM fill code string
30 FOR I=0 TO 21: READ A%(I): NEXT I
40 DATA &h8855, &hB8EC, &h0600, &h07B7, &h76BB, &hBA0C, &h882C
50 DATA &hA76, &hCBA, &h76BB, &hBA08, &hBB34, &h676, &h14BA
60 DATA &hCDFE, &hC9FE, &hCEFE, &hCAFE, &h10CD, &hCA5d, &hB, &h0
110 REM R1,C1 is upper row, column
120 REM R2,C2 is lower row, column to blank
130 R1%= 1: C1%= 1: R2%= 25: C2%= 80
140 GOSUB 1000: REM run blank subroutine

900 END

1000 REM The actual subroutine is here.
1010 DEF SEG: SUBRT%= VARPTR (A%(0))
1020 CALL SUBRT%(R1%, C1%, R2%, C2%)
1030 RETURN
```

to FFFFFFF hex for a single-sided format and FFFFFFF hex for a double-sided format. The way a disk is formatted determines the way the operating system will treat the disk. You can use a single-sided formatted disk in a double-sided drive; remember that the disk will only have 160K storage capacity. You cannot use a disk that was formatted as double-sided in a single-sided drive until you reformat it; this will erase any files existing on the disk.

Whenever possible, the operating system will put a file on the same track on

YOU CANNOT
*use a disk that was
formatted as double-
sided in a single-sided
drive until you
reformat it.*

both sides of a double-sided disk. This will significantly reduce the amount of moving around that the drive heads need to do, hence the speed of file reads and writes is increased enormously.

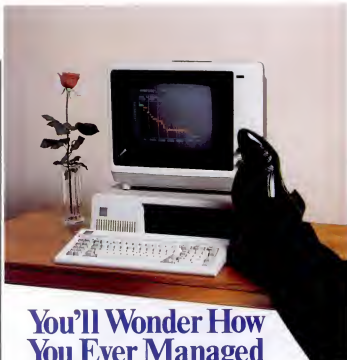
Note that DISKCOPY is a bit capier; if you copy a disk formatted as single-sided, then the target disk's capacity will only be 160K. Even if the disk is physically suitable for double-sided use, the six-byte flag in the file allocation table will insist to DOS that the disk was formatted as single sided.

If you want to make a double-sided copy of a single-sided disk, use the following instructions.

A>FORMAT B: will automatically format the disk to be double sided. If the DOS system must be included on this disk, then run A>FORMAT B:/S instead.

Then A>COPY A:.* B: will copy all of the files onto the new double-sided disk. /PC

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CIRCLE 301 ON READER SERVICE CARD

This small, hand-held device is skyrocketing in popularity. Users claim it cuts editing time in half, sprints through menus, and makes graphics a breeze.

The Tale Of The Mouse



Several years ago the Soviet press reported the discovery of a young Russian woman who could somehow read with the tips of her fingers. While blindfolded, she would fondle a newspaper and call out headlines to startled observers. The story even made *Life* magazine.

Perhaps she could use the PC's cursor editing keys with ease. If so, she'd be in a distinct minority. Machine-gun typists can tap out 120 words per minute on this keyboard, but screech to a halt when they have to edit. IBM has buried its cursor movers in a thicket of keys that force users to stare up and down from the keypad to

the screen and back again, like those ornamental nodding dogs you see in the back windows of old Buicks. And even when your fingers are firmly planted on the proper keys it can take forever to watch the cursor blink its way laboriously across the screen.

That is, unless there's a mouse in your house.

And if such manufacturers as Apple, Xerox, VisiCorp, DEC, Symbolics, and Sun have their way, there soon will be. It will be wired into the back of your unit, and you'll wonder how you ever got along without it.

A mouse is a sort of rolling function key that you slide across your desk. If you move the mouse up and to the right, the cursor on your screen moves up and to the right. It is sensitive enough to move pixel by pixel—but can scoot you all the way from one corner of the screen to another in a fraction of a second. Try that with cursor arrows.

And computer mice come with one to three programmable buttons that let you edit, draw lines, or select menu choices without ever touching the keyboard. Such menu-driven systems as Apple's new Lisa or the Xerox 8010 (better known as the "Star") have, in fact, elevated the mouse's status from a laboratory curiosity to rodent stardom.

An Ergonomical Leap

The first mouse was a native of California. In the early 1960s, a 36-year-old visionary named Douglas Engelbart joined the Stanford Research Institute (SRI) to explore the interaction between man and computer. Funded by the Pentagon's Advanced Research Project Agency, NASA, and the Air Force's Rome Air Development Center, he established SRI's "Augmented Human Intellect Research Center."

One of Engelbart's objectives was the development of "interactive computer aids" in the form of an "evolutionary" hardware-software system. In July 1963, he first tested what was described as a small mouse-like object, a round-edged box on wheels with buttons "sticking up

on top like ears," that trailed a tail-like wire.

Beneath this device were two wheels mounted at right angles. These were connected to devices that measure changes in movement along x- and y-axes, then to an analog-digital converter that told the computer where to move the on-screen cursor (which Englebart called the "bug").

The mechanism itself was not revolutionary. For decades scientists had been using "planimeters," instruments that help measure the area of a figure when rolled along its perimeter on a chart or map. The SRI device, however, was an ergonomical leap forward.

Englebart's mouse sported three special control buttons that could be pressed singly or in combinations for desired effects. His keyboard was fairly standard, with the exception of an additional shift, a forerunner of today's Ctrl key. The mouse sat in a flat area to the right of the keyboard. To its left, Englebart installed a five-function binary keypad resembling a row of miniature organ keys. All three components were packaged in a sleek console designed by Herman Miller.

Fellow researchers at the Institute fondly recall watching Englebart and his associates stare fixedly into their 5-inch high-resolution monitors as they skittered mice back and forth with their right hands while drumming in binary rhythms with their left. They not only could edit with newfound speed and ease, but could bounce through hierarchi-

cal menus with the flick of a wrist.

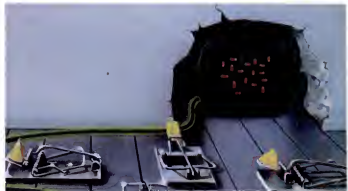
To use the mouse, you begin with a general on-screen menu, move the cursor over the list of selections by rolling the mouse, then click one of the mouse's buttons when the cursor points to the item you want. Successive screens offer increasingly specific mouse-accessible choices. This is essentially the same system that drives Lise and the Star. Users don't have to remember complex commands with their demanding syntaxes. Instead they simply choose from lists of actions and let the computer handle the details.

This obviously puts a great burden on the software designer to fashion menus that will let the users do precisely what they need and want. It also restricts the user who might want to jump from one point to another without having to peuse

et all the intervening menus, or the experimenter who wants to try something unusual or unplanned. However, for users who don't want to learn the control languages—and this includes the vast majority of the population, according to most experts—such a system is absolutely necessary.

Painting by Mouse

The allure of the mouse is not limited to its efficiency in picking items in a list. Anyone faced with the chore of editing will find the mouse a godsend. Its buttons can be set to perform specific editing tasks, or can be used in conjunction with conventional function keys for more complex jobs. By positioning one hand on the mouse and the other above such function keys, you can fly around the screen making rapid text changes.



Designers and graphics buffs will kick themselves for not having discovered mice earlier. Both Lisa and the Star allow you to select shapes from a menu, locate them anywhere on the screen, move them around, change their size, and much more. Lisa even lets the user fill in shapes with 36 different shading patterns, all mouse-selectable. And it allows freestyle sketching by turning the mouse into a sort of wheeled paintbrush. It even smooths out the kinks in mouse-drawn curves.

Serious designers can manipulate the mouse to enter, move, redraw, erase, or otherwise redefine lines in onscreen models. For instance, they can select from palettes of line thicknesses and textures, colors, or standard shapes, and then create and revise complex designs in a fraction of the time it would normally take—ell by rolling mice around on their desks.

Gimmicks, Toys, and Sops

Still, skeptics abound who consider mice gimmicks, toys for lazy tinkers, sops for the masses. The usual complaints are that they're not really any faster than cursor keys, that they require too much desk space, and that they break down after weeks of rolling through dust and tabletop grit. Such naysayers also complain about the amount of time it takes to move one's hand from keyboard to mouse and back, and prefer such alternatives as lightpens, joysticks, and digitizing tablets.

In 1978, Xerox researchers Stuart Card, Bill English, and Betty Burr performed a landmark study in which they pitted a mouse against a joystick, conventional cursor keys, and a set of text function keys typical of those found on dedicated word processors. Earlier research (1967) by English, Englebart, and Berman had shown mice to be far faster than lightpens, tablets, and two types of joysticks in positioning a cursor. Lightpens are fairly quick, but have to be picked up and put down, which takes time. They can smudge the screen—admittedly a minor complaint—and tend to fatigue the user's arm, which is a major drawback.

Card and his colleagues determined that the mouse was significantly faster than the other devices tested, and that its advantage increased with distance. In fact, it was a staggering three times speedier than cursor keys at the maximum test

distance. In additional tests during which users moved a cursor to the target from varying angles, the winner was again the mouse. And, the device with the lowest overall error rate was—you guessed it—Englebart's pride and joy.

An interesting discovery was that it took virtually as long for users to reach the text function keys as to reach the mouse. Researchers attributed this to user



Many users call Hawley's X063X "the Rolls Royce of mice."

delay in figuring out which function key they had to press—the thinking slowed them down. With the mouse, no such extra step was necessary. Users simply groped at the mouse and pushed it where they wanted it. The authors of the study concluded that not only was the mouse faster and more accurate than the other devices, but that its speed was "nearly maximal with respect to the information processing capabilities of the hand-eye guidance system." Can't get much faster than that.

The only area in which the mouse did not outdistance the competition was in moving the cursor one character at a time. But even here it held its own. And, in a later study, researchers were surprised to find that subjects grew so fond of the mouse that they would use it for such one-character moves—even when they knew that in this one case cursor keys had a slight edge in speed.

A more recent cursor-moving device, the touchscreen, has proven to be affective and relatively quick. However, it shares some of the lightpen's drawbacks. The surface of the screen becomes easily soiled, for instance, and the user's arm grows tired. Mice are less fatiguing since the user's arm is not held so high and since his or her hand rests on the mouse for support. However, touchscreens are efficient when the user is standing and operating a screen for short periods of

time, such as at a point-of-sale demonstration.

Positioning Problems

In the first test Xerox ever conducted, the experimenters were chagrined to learn that two-thirds of the subjects were left-handed. Even so, the southpaws preferred to move the mouse with their right hand. But to be safe, Apple plugged its mouse into the middle of Lisa's back so that it could be used on either side of the computer.

Lisa's designers didn't have to worry whether switching sides like this would reverse the functioning of the buttons on Apple's mouse. In contrast to SRI's three buttons, and the Star's two, Lisa has just one. However, researchers do invariably see positioning problems.

This is in part because mice report relative motion rather than absolute motion. Every point on a digitizing tablet has its fixed, corresponding point on the screen. The mouse does not. Move the mouse east an inch, then pick it up and put it back where you started and move it east another inch and the computer will act as if you had moved two inches east in one continuous motion. Turn it backwards and move it west two inches and you'll get the same result.

New users occasionally don't understand this and can get confusing mirror responses by holding mice upside down. A slightly more common problem occurs when a novice knocks a mouse repeatedly against the side of the keyboard while trying unsuccessfully to move the cursor a long distance. However, once the user is shown that the mouse can be picked up and repositioned, such problems rarely recur.

Most first-time users invariably become hooked, and find it difficult, if not impossible, to return to cursor keys after a session with the mouse. Oldtimers and diehard cursor advocates often exhibit a tenacious initial resistance to mice, which they consider gadgets, but usually change their tune after a few minutes of experimentation.

A Growing Litter

In 1972, Jack S. Hawley developed the first digital mouse, for Xerox's Palo Alto Research Center. Three years later, Xerox commissioned him to design a mouse that traveled on a large ball bearing rather than

the two orthogonal wheels used previously. His Hawley Laboratories, which are listed in the local yellow pages under "inventors," produced these "Alto" mice (Hawley prefers to call them "Hawley-Xerox Mice") until 1982. In 1981, Xerox began manufacturing its own new Star mouse for the heralded 8010.

Hawley is proprietor of "The Mouse House" in Berkeley, and produces a mouse he calls the "Hawley X063X" (a name that when inverted resembles that of a major office products company). He is in the process of forming "Son of Mouse House," which will roll out as many as 500 to 600 mice each week.

The Hawley Mouse is essentially an upside-down trackball packed to the gills with precision-made parts. In contrast to some of the others on the market, his is strictly mechanical, and earns high praise from users and competitors for its quality of workmanship and tracking ability. However, since it contains so many hand-tooled components, it is relatively expensive—he originally sold it for \$415, but is charging \$300 as of April 1, 1983.

One complaint about such mechanical mice as Hawley's is that they tend to pick up surface dust, which may jam the precision parts inside. And the clockwork mechanism is not easy to repair. However, Hawley stands behind his mice, and even passes along his usual warranty through repackagers. He refers to the X063X as the "Rolls Royce of mice," and many in the industry agree. They're large and smooth-running and expensively put

EARLY

mouse-users were mostly men.

together.

Hawley's mouse doesn't contain the circuitry needed to plug into the PC. He's worked out an arrangement with Random Access Inc. in Pittsburgh, which sells the proper interface for another \$295, although this price too may come down.

Another mechanical mouse is being sold by Kinetronics, in Arlington, Massachusetts. John Purbrick, a researcher at

MIT's Artificial Intelligence Laboratories, has been making mice similar to Hawley's for years. While both are mechanical, and crammed with custom-machined parts, Hawley's uses alternating conductive and nonconductive segments on a rotating shaft to transmit changes in position, while Purbrick's, like most electromechanical mice, relies on an optical encoding system.

Many of Kinetronics' customers use the mouse for CAD/CAM or graphics work. One button toggles pen up/pen down, one the erase mode, and one the brush size/line width. Other configurations are easily set. Purbrick has seen many beginners who would otherwise be put off by the rigors of programming languages, do complex programming by using his mouse. And mice allow advanced programmers the luxury of working without taking their eyes off the screen.

Hawley's mouse will resolve up to 200

points per inch at the rate of 40 inches per second, while the Kinetronics device claims a resolution of 400 points per inch at speeds up to 10 inches per second. This is exceedingly fine—and expensive. A Kinetronics mouse goes for \$500, and you have to interface it yourself. But it is among the most rugged sold. Mice are generally fragile, but Purbrick's has a floating ball similar to Lisa's that allows it to survive rough treatment.

Both The Mouse House and Kinetronics produce classic mechanical mice with three buttons, as does a Redwood City, California company, Product Associates Inc. (PAI). PAI's system resembles Hawley's; motion is conveyed by two right-angle wheels. This mouse, however, plugs into the PC game board and sells for \$149. If you don't have a game port, PAI will sell you a serial interface that also includes a printer port for an additional \$200.

3G, in Gaston, Oregon also sells its



Top: Two-button mouse from 3G rolls on foam rubber wheels. Bottom left: The Depraz mouse is imported from the watchmaking region of Switzerland. Bottom right: Kinetronics' classic mouse has sky-high resolution—and a price to match.

Product Information

The Mouse House

1741 8th St.
Berkeley, CA 94710
(415) 525-5533
List Price: \$415 (\$300 after 4/1/83)

Kinetronics

12 Park St.
Arlington, MA 02174
(617) 646-6246
List Price: \$500

Logitech, Inc.

165 University Ave.
Palo Alto, CA 94301
(415) 326-3885
List Price: \$350

Product Associates, Inc.

465 Convention Way
Redwood City, CA 94063
(415) 364-3121
List Price: \$149 for mouse; \$350 for mouse and interface

3G Company

Route 3, Box 26A
Gaston, OR 97119
(503) 662-4492
List Price: \$150

XEC Company

14222 Dallas Parkway, # 1104
Dallas, TX 75240
(214) 980-9736
List Price: \$99.95

Mouse Systems Corporation

2336H Walsh Ave.
Santa Clara, CA 95051
(408) 988-0211
List Price: \$286 for mouse, \$26 for interface

USI International

71 Park Lane
Brisbane, CA 94005
(415) 494-9111
List Price: \$289

entry for \$150, and it, too is a ball-less mechanical mouse. What makes this different is its wheels; they're made out of foam rubber. Creator Maris Grauba said users told him they found precision-made, balled mica too fragile, expensive, and susceptible to dust. They also complained that mice rolling on hard steel balls had trouble with slick formica desktops. His rubber tires really grab the road. Graube's mouse plugs into the PC cassette port, and yields a decent 235 points per inch. It comes with demo software, boasts two buttons, and will be ready for delivery in the late spring.

While all available mica are slightly different under the hood, all but one are essentially box-shaped. Some have rounder corners than others, and the more recent additions are becoming smaller. While the early mica were described as being the size of a pack of cigarettes or a bar of soap, the trend has been to shrink the package. Early mouse-users were mostly men. Now that mice are creeping into the office, manufacturers are designing them to fit a woman's hand.

The one mouse that looks something like a mouse—or, more accurately, like a cat's toy—is a stylish import from Switzerland with a distinguished pedigree called the Depraz Mouse. Designed at the Federal Institute of Technology in Lausanne, it has been used for the past 4 years by Niklaus Wirth's Lillith computer in Zurich. (Wirth invented, among other things, Pascal.)

The Depraz, imported by Logitech in Palo Alto, is hemispheric for optimal palm-fit. It is now being manufactured in the Jura region of Switzerland, where, according to its makers, "the famous Swiss music boxes are manufactured, together with the watches selected for NASA flights to the moon." Futura plans call for production in the Orient.

This mouse has earned praise for its construction and design. It has three buttons with tactile feedback, yields 15 points per millimeter, and comes in four models (with two more expected shortly), one of which is expressly configured for the PC. Logitech provides an interface that plugs into the keyboard port; both the mouse and the IBM keyboard plug into it. PC owners should find this mouse attractive, as it needs no software to make it work—the PC thinks it is just a blazingly fast cursor key. The mouse, PC interface, and a test game are sold as a package for \$350.

The least expensive mouse soon to be available is one from XEC in Dallas. This mechanical mouse, expected shortly, will sell for \$99.95. Details on it are spotty, but the manufacturer says it will plug directly into the PC game card.

Mechanical Versus Optical

All of the mice described above work mechanically, by counting the revolutions of a shaft attached to wheels or a ball. Some do the counting electrically, but most use optical decoders. However,

a new generation of mica is entering the marketplace. These forage moving parts and track their positions optically, by moving across a precise grid and counting the lines as they pass over them.

Optical mice have several advantages over mechanical ones. They have no moving parts to break or wear out. They are quiet and relatively inexpensive to make. The scale of movement can be varied simply by changing the size of the grid on which they slide. There are no wheels or ball bearings to clog with dust. There are no surface-gripping errors. They can be miniaturized to fit the smallest hands. They don't normally need complex interfaces, since they can contain all such necessary electronics on their main internal circuitry.

They do have drawbacks, however. The most annoying is that they require a grid, which takes up space on a desk. (One user reported that he could control cursor movement by sliding it across the blue-on-white weave of his worn jeans.) Resolution is less precise than that of

OPTICAL
mice have several
advantages over
mechanical ones.

mechanical mice, but for most applications it is still sharper than that of the screen.

The first commercial solid state mouse was produced by Steve Kirsch, at Rodent Associates, now called Mouse Systems Corporation. Sporting three buttons, and traveling on felt pads, Kirsch's mouse tracks its position by shining Light Emitting Diodes (LED) onto colored lines on a sheet of aluminum.

Kirsch's mouse performs a self-test and will send error messages to pinpoint any problems. Internal dip switches allow you to set rotational orientation. It is already being sold by two other companies, SUN Microsystems, Inc. and Summagraphics Corp. Kirsch's three-button mouse sells by itself for \$288, and can be purchased with an IBM serial interface for an additional \$26.

The other optical mouse on the market, dubbed OptoMouse by its manufacturer, USI, of Brisbane, California, also requires a grid—but in black and white. USI claims it is the first microprocessor-controlled, optical "smart" mouse available. It can emulate existing bit pad graphics protocols, and plugs into the serial port (although PC users will need their own software to drive it).

SKEPTICS *abound who consider mice gimmicks, toys for lazy tinkerers and sops for the masses.*

USI's OptoMouse sells for \$289. Company spokesman Andy Marken says this is because they've made it intelligent. "It wouldn't be difficult for a company to stamp out cheap mice," Marken said, "the key would be to take all the controls out of the mouse and put them into software. The more intelligence you put into the mouse, the higher the price."

Apple is quick to point out that its system of mouse-driven menus allows such rapid learning that purchasers can do useful work 20 minutes after they take Lisa out of the box. This is the reason it went with one button instead of two. Apple admits that while experts find the extra button helpful, it is far easier for most people to learn and work with a single button in normal office conditions.

VisiCorp spokesman David Spencer explained that the key to such rapid learning is that mice take advantage of a very natural human trait, pointing. The mouse becomes an extension of the arm. Cursor key movement demands extra cognitive steps. (In the process of producing Lisa, Apple executives realized that their one-button mouse didn't resemble its nemesis, and briefly considered calling it "the Pointer" instead.)

VisiCorp's new "operating environment" software package, VisiOn, includes a mouse and will give PC owners many features similar to Lisa's. A survey of VisiCalc purchasers indicated that

three-quarters of them would demand an integrated software system like Lisa's by this year. VisiCorp is still considering both mechanical and optical mice, although the one it exhibited at Comdex in Las Vegas was mechanical.

Standard Issue

PC users who want to slash their editing and menu-selection time in half or turn the screen into a graphics palette have several choices at present. Lightpens and touch screens are fatiguing and can smudge their monitors. Digitizing or bit pads require the picking up and putting down of a stylus. While they can produce precise results, they take up considerable desk space and are expensive. And they cannot generally provide rotational position information.

Joysticks are usually close behind mice in tests of speed and accuracy, but can be difficult to maneuver in tight spots. And virtually anything a joystick can do well, a mouse can do slightly more efficiently. Trackballs take up very little desk space, but users find it takes longer to get to where they want on the screen. And once a user's hand has spun the ball, his or her fingers have moved away from the buttons.

Mice are speedy and accurate. The user's hand is always in the same place relative to the buttons after moving. The kinds of human movements required are natural, and allow the user to look at the screen without interruption while moving the cursor. Scales can be changed quickly and easily. While mice were once very expensive to make, new electronic designs and mass production techniques made possible by their popularization in such systems as Lisa and the Star are bringing the prices down dramatically.

Today, computer operating systems are becoming increasingly transparent and easy to use. Menu-driven systems are relieving the busy user from the necessity of memorizing long strings of alien-sounding commands. Experts agree that the mouse is an ideal tool for such manual selection, and many predict that mice will soon be standard issue with all computers. Mouse-driven palettes can also free artists and designers from the constraints of coordinate-based graphics and allow them to translate images and ideas quickly to the screen.

What lies ahead for mice? Manufactur-

ers report that they have already seen sample Japanese mice that cost as little as \$10 to \$15 to make and will probably retail for under \$50 later in the year. One manufacturer is working on an improved "joystick/pseudo-mouse" that he claims incorporates the best features of both devices. Touch pads are being developed that will let the user point and paint with a finger rather than a stylus (or mouse) and avoid soiling the monitor screen.

Xerox is reported to be perfecting a tiny, photodiode mouse—essentially a miniature solid state TV camera—that will fit neatly under anyone's hand. Other companies are working on voice recognition systems that could direct the cursor across the screen without requiring any hand movements whatsoever, although such a device might not be feasible in a noisy office.

Doug Englebart, the father of the mouse and a genuine pioneer in user friendliness now works as senior scientist at Tymshare. He is happy to see the results of the revolution that he helped touch off, and pleased that such devices as the mouse and the hierarchical menu have finally gained wide acceptance. But he is also somewhat dismayed at all the media hoopla.

Englebart feels that the computer sys-

MICE ALLOW *advanced programmers the luxury of working without taking their eyes off the screen.*

tem will soon die down and people will start using all of these devices to augment human intellect. He points out that people are galloping into the computer field so quickly and are so absorbed with the glitter that manufacturers can't seem to get their attention to find out what they want to do with their new tools, where they want to go. But, he concedes that he's succumbed to the allure of the microcomputer as well. He even has one on his desk—an IBM PC. /PC

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PC MAGAZINE 73 FEBRUARY 1983

VisiCorp's pet program, which will be available later this year, has generated much speculation and anticipation. Here's why . . .

VisiOn, A Mouse On The

VisiOn

VisiCorp
2895 Zanker Road
San Jose, CA 95134
(408) 946-9000
List Price: To be announced

Back in 1978 a tiny company, Personal Software, sparked a revolution in microcomputing with the introduction of an electronic spreadsheet called VisiCalc. Now, 5 years after making "What if . . ." famous, this company (renamed VisiCorp) is attempting another coup with a package of software and hardware dubbed VisiOn.

VisiOn promises to give IBM PC owners many of the features boasted by Xerox's high-priced Star Computer and Apple's new Lisa. All three systems provide an entirely new way to operate computers. Each is menu-driven, offering lists of possible actions. You simply point to

what you want to do by using a mouse (see preceding article) that tracks the motion of your hand. Then you press a button on the mouse to indicate a selection, and start working. For many PC owners it will be like trading in a clumsy stick shift for a silky automatic transmission.

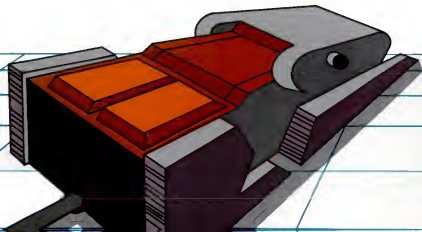
To use VisiOn on the IBM PC, you need a minimum of 256K RAM, a graphics adapter, and a hard disk. However, any additional memory should improve the performance of VisiOn noticeably. (Many VisiOn systems will have as much as 512K RAM.) VisiOn requires a hard disk, which is not yet available from IBM. However, IBM will probably have announced a hard disk for the PC by the time VisiOn hits the market. Hard disks for the PC are already available from several independent sources.

What Does VisiOn Do?

VisiOn provides a simple, menu-oriented way to use the PC. Rather than requiring you to memorize lists of commands and complex syntaxes, VisiOn lets you indicate what you want by pointing a

small arrow on the screen at various items on the menus. The arrow is controlled by moving the small, plastic mouse. A thin wire connects the mouse to a standard RS-232 serial interface on the PC. Inside the mouse are electronics that sense the movement of your hand, and transmit the change in location to the PC.

VisiOn is intended to be used by office workers, the people VisiCorp President Terry Opendyk calls "paper-pushing knowledge workers." It is designed to be both easy to learn and easy to use. There is an important distinction between the two, since some products that are easy to learn become unbearably tedious by the time users become familiar with them. On the other hand, some users might find the more popular word processing programs difficult to learn, but extremely simple to



Digital Desktop

operate once mastered. VisiOn is an attempt to provide both easy learning and efficient production capabilities.

VisiOn is designed to be used with a wide range of computer hardware and operating systems. Apart from simplicity and ease of use, an important feature of VisiOn is adaptability; you can transfer your experience from one program to another, and from one machine to another. Once you learn how to use a spreadsheet program under VisiOn with one machine, you will know how to use it on any other computer that supports VisiOn. Naturally, this benefit will occur only if VisiOn is widely adopted, both by hardware and software firms, and is well received in the marketplace.

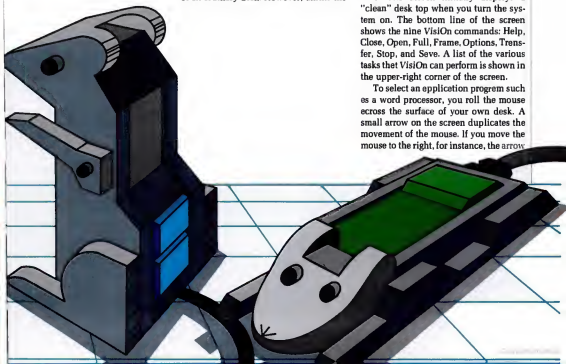
VisiOn has not yet been released, but has already generated considerable interest. The crowds at VisiCorp's booth at the recent COMDEX show seemed enthralled by the VisiOn demonstration. Digital Equipment Corporation (DEC), the second largest computer maker after IBM, has announced its support for VisiOn on the DEC Professional series. If IBM decides to offer it on the PC, it will almost guarantee that VisiOn will become a standard, widely accepted user interface. Unfortunately, you'll probably have to wait until at least this summer before finding VisiOn in your local computer store.

What you see on the screen when using VisiOn is a representation of the top of an ordinary desk. However, unlike the

Xerox Star and Apple's Lise, VisiOn does not use small pictures (sometimes called "icons") to identify various actions or objects. Since the current IBM graphics adapter lacks sufficient resolution, VisiCorp felt there wasn't enough detail to use such icons effectively. Instead, VisiOn uses conventional text descriptions. As you move the mouse to control the cursor, each action you select is displayed in reverse video. It is always clear both where the cursor is on the screen, as well as which command or option is about to be selected.

Several things appear on the VisiOn screen at the same time, in much the same way as sheets of paper arranged to overlap so that more information is visible at one time. The screen initially displays a "clean" desk top when you turn the system on. The bottom line of the screen shows the nine VisiOn commands: Help, Close, Open, Full, Frame, Options, Transfer, Stop, and Save. A list of the various tasks that VisiOn can perform is shown in the upper-right corner of the screen.

To select an application program such as a word processor, you roll the mouse across the surface of your own desk. A small arrow on the screen duplicates the movement of the mouse. If you move the mouse to the right, for instance, the arrow



moves to the right. When the arrow is positioned over the name of the program you want to use, you press the "Select" button on the mouse, and the system loads and reads the program.

What About the Keyboard?

A natural question about mouse-oriented systems is "What happens to the keyboard?" Some of the finer points of how VisiOn plans to handle the keyboard are still being decided. But the philosophy is clear; every key has only one purpose, to "deposit" a character (such as the letter A) or to perform a single, specified function. Even though the mouse is a handy way to point to things on the screen, there may be times when using the cursor control keys might be easier, such as character-by-character editing within a word processor. VisiOn will probably not force you to use the mouse when the keyboard would be more convenient. As VisiCorp President Opandyk puts it, "We are not fanatics about the mouse. VisiOn is designed to be used with any x-y pointing device."

Integrated Help

If you run into trouble while using VisiOn or any of its applications products, there is a "Help" system that provides a complete network of information about each function. For example, if you do not understand how to use an option in the plot program, you can display the help menu for plotting on a blank area of the screen, with the plot that you are working on still in view.

This integrated help system is an excellent feature. It is available at every level, from the broad, general descriptive

information that helps you understand the big picture, down to details about specific options. Such hand-holding is expensive (it's also one reason VisiOn requires a hard disk) but the increase in productivity should well be worth the cost of extra disk storage.

VisiOn lets you do more than one thing at a time. Here again, the analogy to an ordinary desk in an office is appropriate. At a regular office desk, you might be writing a memo, and then be interrupted by a phone call. While you are talking on the phone, you may grab your desk calendar and make an appointment to see a client for lunch on the following Monday. When you use the calendar, it may temporarily cover the memo you were working on before the phone call. When the call is over, you put your calendar back in its place and continue writing the memo.

When you were interrupted by the phone call, you temporarily attended to another task (making an appointment) and then returned to what you were doing earlier (writing the memo). You did not continue writing the memo and make the appointment in the desk calendar at the same time. This is exactly how VisiOn works; it lets you have several activities "on your desk" at one time, each shown on its own window; but you use only one window at a time. This "active" window displays the task that you are currently focusing on.

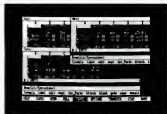
Just as you might consult a dictionary, use a calculator, or look up an address in your rolodex file while writing a memo, you are free to structure the appearance of your VisiOn desk any way you choose. You might want to have a spreadsheet open, and at the same time have a win-

dow of help information in front of you listing the directions for entering a formula. However, at any given moment, you are actually using only one window at a time.

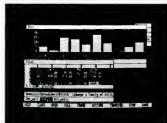
The optional VisiOn command, "Full," expands a particular window to fill the entire screen. I haven't used the system long enough to form an opinion, but my guess is that most people will prefer to work with a single window much of the time. But when you need to look at several things at once, VisiOn is unbeatable.

VisiOn lets you display several windows on the computer screen at once, and gives you access to several programs simultaneously. However, you may have only one window "active" at a time. You can switch back and forth between windows, alternately making each active. But when one window is active, all others are passive. There are exceptions to this rule. The system supports a print spooler, so that the printer can type a letter while you are entering new information into a spreadsheet. Later versions are expected to support a local network that will operate at the same time that the user is doing other things at the keyboard.

Moving information is so important that it is one of the nine basic VisiOn commands; data can be transferred easily from one window to another. When the transfer command is selected, you are asked to point to the window containing the data to be moved. You then use the mouse to show the system how much of the window to copy. Finally, you point the mouse to the window where the data is to go. The entire procedure is natural, and easily remembered after just one demonstration and run-through.



Figures from two spreadsheets at the top of the screen (labeled "East" and "West") are consolidated in a window labeled "Total." Note that "West" is the active window.



Data can be displayed in a variety of formats. Spreadsheet totals have been transformed into the bar chart at the top of the screen.



Three VisiOn windows are displayed simultaneously in this typical application: a memo in the background is covered by a bar chart and a spreadsheet.

VisiOn handles the transfer of data between programs in a clever way. It attempts to preserve as much of the context of the data as possible. For instance, if it is moving data from one spreadsheet to another, it will completely preserve everything it already knows about the columns and rows of figures. But if it has to

ANYTHING THAT
is good for users is
ultimately good for
software developers.

transfer data from a spreadsheet to a word processing document, all it will do is move the numeric text to the target document. This "typechecking" helps prevent errors that could arise if you asked it to do nonsense operations, such as use a letter to your mother as the input data for a spreadsheet.

Scripts: A Way to Build Macros

An interesting VisiOn feature allows you to predefine a series of operations. By selecting what is called "script" mode, you can record a series of VisiOn commands and options in a file that can be stored for later use. Called "macro expansion" in other systems, this lets you perform a complex, multi-step operation just once, then have the system run through all the steps for you automatically whenever you want, at the touch of a button.

I saw VisiOn demonstrated with a three-button mechanical mouse. However, the operator used only two of the buttons, one to select an item, the other to scroll. VisiCorp hinted that it preferred several optical mice because this increases reliability and contributes to lower cost.

After seeing VisiOn demonstrated, I was able to spend only a few minutes actually using the system. When I say a "few minutes," this is not a figure of speech. For whatever reasons, VisiCorp did not seem comfortable letting me use the system for an extended period of time. The VisiCorp people were very friendly and helpful, but surrounded me with four

staffers who seemed anxious that I wrap things up and get back on the plane. My hunch is that while most of VisiOn itself is working, there are probably holes in the system, since it is still under development, as are its various applications products. So, the longer I sat there, the more likely I was to find a problem. Keep in mind that my reactions to VisiOn are based on a brief demonstration, and a limited amount of actual hands-on experience with the system. A full evaluation will have to wait until the system is released later this year.

I found the VisiOn mouse harder to use initially than I had expected. This makes it somewhat difficult for beginners to point the cursor arrow at the correct menu item. But after a few minutes of practice, I got used to the feel of the device. I was also surprised by the distance that I had to move the mouse to select some of the options. A quick check indicated that moving the mouse 8 inches on the table surface moved the cursor arrow across the width of the screen. Sometimes I had to lift the mouse up and reposition it to have enough room. Since the mouse and the software were both pre-production, I imagine that these details will be worked out before the product is released next summer.

The ratio of mouse movement to the movement of the cursor on the screen is something that different users may want to adjust. Some will require more precise onscreen movements than others, while some may have less tabletop area on which to roll the device. Some clever compromises are possible, such as changing the ratio of screen-to-mouse movement in proportion to the speed of mouse travel. In such a scheme, a small movement, such as selecting between two adjacent menu items, would require a fair amount of hand motion. However, a quick jump from the bottom to the top of the screen would take only a bit more movement.

Four Layers of Software

Four layers of software are involved when an application program is used on a VisiOn system. At the bottom level is a standard operating system, such as IBM's DOS. The second layer is VisiHost, which extends the operating system by implementing over 140 additional system calls

for use by VisiOn. Just above VisiHost is VisiOn, the first layer the user sees. The fourth level is the application program, such as a spreadsheet, word processor, graphics package, or data base manager.

VisiHost provides the interface between VisiOn and the operating system. When VisiOn is transported to new hardware or a different operating system, the only part that has to be changed is VisiHost. Both VisiOn and the applications that run under it are completely unaware of the underlying operating system and hardware configuration.

Largely Written in C

According to group manager Bill Coleman, about 70 percent of the PC version of VisiHost is written in assembly language, with the remainder written entirely in C, as are all VisiCorp's new applications programs. This heavy use of C will help VisiCorp a great deal when it needs to port its software to another computer system that uses a different processor. In such a case, the VisiHost assembler code has to be extensively changed. But once VisiHost is working in the new environment, the rest of VisiOn and its application packages can be transferred with little additional effort.

The VisiCorp people seem eager to avoid the impression that they are getting into the operating systems business. More than once during my interview the topic was raised, and each time there was an emphatic response that they are not interested in writing operating systems, and never intend to get into that area. When you look at the specifications for VisiHost, the dividing line between it and a regular operating system is thin. True, VisiHost uses many of the services of the underlying operating system, such as its file system. VisiHost imposes its own structure on an operating system file, so that you can look at VisiOn file names using a standard operating system command such as DIR on the PC. However you won't be able to use these files other than with VisiOn programs. From what I understand of VisiHost, it may add more system calls to a given operating system than were available in the first place. Is VisiHost an operating system? I guess not, since VisiCorp says it's not.

VisiHost extends an operating system by supporting new system calls, or prim-

itive features that VisiOn can use. For example, it supports an elegant method of managing memory, which is similar to what is known as "virtual memory." Although VisiCorp uses standard, off-the-shelf C compilers, the company developed its own linker. VisiCorp clearly has the talent and skill to build an operating system, but it has decided for business

WHEN IT'S introduced, VisiOn promises to give IBM PC owners many of the features boasted by Xerox's high-priced Star Computer and Apple's new Lisa.

reasons to work with other operating systems developers instead. Given the current battle among the various operating systems in the micro world, this is probably a wise decision. If VisiOn becomes a de facto user interface standard, VisiCorp will clearly have the last laugh.

VisiOn handles windows on the screen in a way that makes it look as if one piece of paper is on top of another. While it treats the screen as a bitmap, the application programs that run under its control do not have to worry about any of this. The application program simply handles text to VisiOn. This means that application programs can easily be converted to work in the VisiOn environment. Even more important, the application program is completely isolated from the quirks of specific hardware/operating system configurations. This clean division of responsibilities between the application program and VisiOn/VisiHost may be one of the best features of the entire system. It allows a software developer to have the benefit of portability while still retaining a highly interactive user interface.

Benefits of a Common Interface

In a large organization, the common user environment provided by VisiOn

could result in major cost savings. For example, a given spreadsheet program would work exactly the same on an IBM PC running PC DOS as on a DEC VAX 11/780 running the XENIX operating system, if VisiOn was supported on both machines. When I asked the people at VisiCorp whether they planned to support UNIX, they smiled. It turns out that almost all the VisiOn development was done using UNIX on a VAX.

The consistent VisiOn interface helps you learn how to work with new applications packages. With today's operating systems and software, the rules about how to accomplish common tasks often change from one environment to another. Within IBM DOS, for example, the command to display the disk directory is DIR. But if you type DIR while in BASIC, you'll get a Syntax Error message. In BASIC, you need to give the command, FILES, and you see somewhat different information in a different format than that provided by DIR. There are many such differences between the operating system level (DOS) and BASIC. The important point is that what you learn about DOS isn't much help when you enter the world of BASIC, or other application programs.

Help For Software Vendors

Software developers should also benefit from any wide adoption of a VisiOn standard. First, anything that is good for users is ultimately good for software developers, because more people will be using computers, which expands the market. Second, the consistent user interface lets the developer concentrate on solving the specific application problem, without taking time to design yet another user interface. Put another way, the developer becomes responsible for the content and style of interaction, but is able to use the VisiOn method of interacting. This also simplifies the preparation of user documentation, since it's fair to assume, for example, that a VisiOn user knows how to use a mouse.

There are enhancements to the current PC that would improve VisiOn performance. IBM's graphic adapter now provides 200 rows of 640 dots each. The resolution is just barely sufficient. For example, characters are displayed using an 8

by 8 dot matrix, which gives text a slightly coarse, greasy look. Also, there simply isn't enough resolution to use various styles of typefaces, such as italic or bold, or different sizes of type. Apple's Lisa has a resolution of 364 rows of 720 dots. This extra screen resolution yields a much better-looking display than the current IBM graphics adapter does when used with VisiOn.

Since VisiOn treats the screen as one big bitmap, it has to do extensive work every time it scrolls a line of text or changes the display. This means that the speed capacity of the 5MHz 8088 processor is a bottleneck for VisiOn. In the brief time that I was able to use the prototype system, it was obvious that a faster processor would make VisiOn much more pleasant and productive to use. If IBM releases a faster version of the PC—perhaps one that uses the Intel 186 or 286 processor—the effect on products such as VisiOn will be remarkable.

Another improvement would be specialized hardware support for so-called "BITBLT" (Bit block transfer). The ideal solution would be a faster central microprocessor and special hardware that supports the fast, easy manipulation of bit-mapped graphical images.

VisiOn uses three cursors: a standard arrow, which shows the current location on the screen; a four-headed arrow when scrolling; and a stylized hourglass when performing a time-consuming operation. The cursor symbol performs time-consuming magic. It takes the screen image that would normally be at the cursor location and stores it away, then draws the cursor symbol. This ensures that the VisiOn cursor will be clearly visible,

COMPANY executives say VisiOn is about 99 percent complete.

regardless of the background image. If the graphics hardware supported independently-movable graphic objects (often called "sprites"), this overhead for displaying the cursor symbol would be

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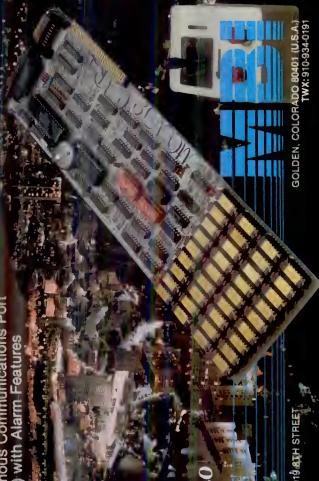
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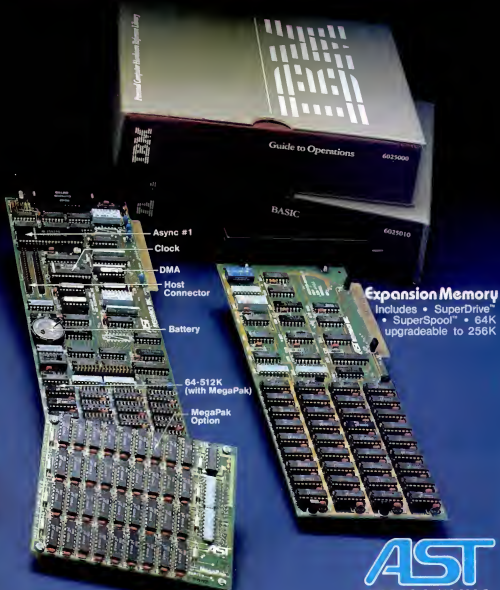
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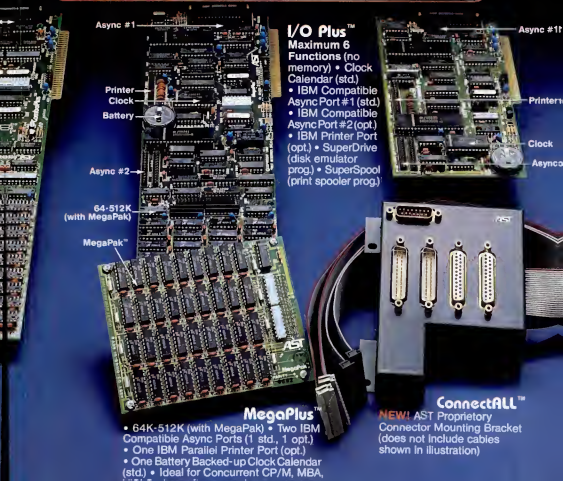
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At VisiCorp, many of the personal computers are connected to two VAX 11/780 minicomputers. Programmers write code using a text editor on the personal computer, then ship the program to the VAX to be compiled. The object code is shipped back to the personal computer where it is tested in the environment in which it will eventually be used.

Each night, the VAXs are kept busy controlling an elaborate software testing program. They have captured the actual keystrokes for thousands of operations of products such as VisiCalc. As programs are improved they are run against all the stored tests, and the output is compared with known results. By using the VAX to control such tests running on many machines, they are able to perform between 200,000 and 300,000 comparisons in a single night.

What Next?

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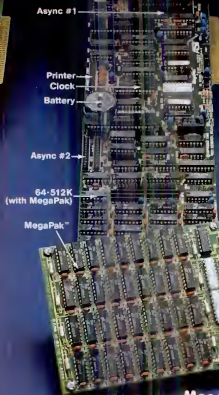
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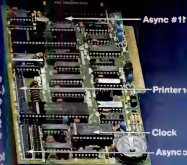
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Programming Tools	5,332
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Vertical Industry Packages	2,164
Home Use	514
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 - Disk File (Data) (4)
 - Disk Index Program/Tables (1)
 - Logons (1)

Programming Tools Not Listed In Other Directories

PROGRAMMING TOOLS (CONTINUED)

- Complex Program Development* 160
- Complex Program Development* 160
- Complex Program Editor* 171
- Complex Program Generator* 181
- Complex Processor* 171
- Complex Programming* 171
- Language* 171
- Interpret* 171
- Metric Management* 181
- Optimization Editor* 171
- Pascal Compiler* 181
- Pascal Library* 181

[illegible]

- Chemistry (54)
- Comp. Theory (10)
- Math. Analysis (43)
- Mathematics (5)
- Physics Program (1)
- Program Analysis (Schindl (95))
- Programming (Ad (85))
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SOFTWARE/COREY SANDLER

How well can these three home finance programs handle paychecks and checkbooks? One may be worth including in your personal software budget.

Personal Finance Programs For The Personal Computer



Here is a trio of home financial programs: Three to get ready, two only for show, and one worth the money.

Any of these budget programs—and new ones seem to come onto the market for the IBM PC every week—will assist you in balancing your checkbooks, keeping records of your expenditures, and preparing for your yearly wrestle with the tax man.

But some programs are better than others. One of the three reviewed here, though not perfect, easily outclasses the competition.

A home finance program can be many different things to different people. Some users expect nothing more than a computer-assisted calculator to help balance a checkbook. Others might look for a computerized record of checks. Some might ask for a program that could make the check register into a database which can assign checks and income items to various predetermined categories for budget analysis and tax records. Others might call for budget planning functions, including analysis of cash flow and monthly surplus/deficit records.

The program that is closest to meeting all these expectations, and way out front in terms of design and range of features, is Best Software's *Personal Computer/Personal Finance Program*.

Two other programs, *Home Finance Program* from Design Data Systems Corporation, and *Home Budget Program* from Howe Software, suffer by comparison, but if your needs match what they deliver,



Before you buy a multi-function RAM board for your IBM™ PC — here's what you need to know about ANATRON's "answerRAM"...



it gives your PC professional system expandability

The answer for business and professional users

Now, there's a high quality expansion board for your IBM PC that combines:

- up to 256K of additional RAM
- 3 complete I/O ports, fully compatible with your IBM
- the best communications interface you can buy

... "answerRAM" from ANATRON.

Memory and more — the most complete board yet

Most PC owners buy a multi-function RAM board for two reasons: for additional main memory, and to get additional Input/Output (I/O) ports without using up precious expansion slots on the IBM PC's motherboard.

Like all quality RAM boards, "answerRAM" gives you RAM expansion in

64K increments up to 256K, with parity checking, fully compatible with your IBM PC.

But beyond that, "answerRAM" is also the most comprehensive I/O board available — with two serial communications ports and one parallel printer port, fully wired — ready to go. Best of all — memory and all three I/O ports use only one slot!



Anatron, Inc.
202 West Bennett Street
Saline, Michigan 48176
1 800-521 0521

"answerRAM" lets your system grow

With "answerRAM's" I/O capability you can connect your PC simultaneously to a letter quality printer, a high speed printer, and a data service or local area network. Now, you can use the most appropriate printer for the job — without fussing to change cables or wasting your time. Or, you can access a data service or download data from your company main-frame computer, without disconnecting your printer.

So why buy a board that will limit future expansion, when "answerRAM" costs the same as less functional boards?

With "answerRAM" you get the most out of one expansion slot — saving others for future enhancements — so your system can grow as your needs grow.

The best communications interface — hands down

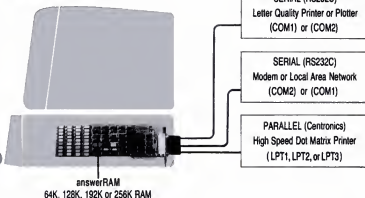
Take a close look at what is required to use the available I/O ports offered on other multi-function RAM boards. Not only are there fewer ports than "answerRAM" provides, but nearly all require you to modify the board, add connectors or use up additional slots to utilize all their I/O ports.

"answerRAM" is designed for business users who need a professional solution. All I/O ports connect through a single, heavy-duty 37-pin connector, rigidly mounted in the standard rear slot of your IBM PC — just like it belonged there. No flimsy ribbon cables snaking around the chassis. We've even made a unique, heavy-duty, shielded, "3-into-1" cable for attaching all peripherals.

Absolutely no clock — here's why

Unlike other boards, "answerRAM"

Sample Configuration



does not include a board-mounted clock — by design. Your PC has an internal clock/calendar. True, it needs to be initialized each time the system is started, but board-mounted clocks that try to save you that trouble create new problems instead:

- they use address space that may conflict with future enhancements
- they must be disabled if your PC clock is to be synched with a network clock
- you must carry the clock software on all your system disks

We put our clock on our disk-controller board where it belongs.

Software to process faster, print more conveniently

"answerRAM" comes complete with software to make your additional

RAM function like an electronic disk or as a print spooler. And we've included a nifty piece of software that lets you toggle the system's default printer port from one port to another with just a keystroke.

Comparison Chart

	I/O ports — "3-into-1"	Parallel Port	Serial Port	Electronic Data	Post Script	Clock Calendar	At all communications	User only 1 slot
ANATRON "answerRAM" *	●	●	●	●	●	●	●	●
AST ComboPlus *		●	●	●	●	●		
QUADRAM Quadboard *		●	●	●	●	●		
SEATTLE RAM *			●	●	●	●		NA
TECHMAR ALLHOME *		●	●	●	●	●		

*all I/O ports factory-wired to all necessary connectors — no user modification required

*manufacturers own cable available for interface to peripherals

Specifications:

Memory: 64K, 128K, 192K, or 256K with parity, just as IBM installed
I/O: 2 Asynchronous Serial ports Configured as COM1 and COM2 Programmable, for 50-9600 baud, 1.5, 5, or 8 bit generation, even, odd or no bit parity, 5.0, 7, or 8 bit character communication
1 Parallel Printer port Configured as LPT1, LPT2, or LPT3 All ports can be disabled

Cable Connectors: 37 pin commercial grade connector and support bracket mounts in chassis
"3-into-1" heavy duty cable with 37-pin connector
2 each DB25 (RS232C) connectors
1 each "Centronics" connector Cable is jacketed and shielded
Manual: Illustrated 26 page manual in IBM PC owner's manual format
Warranty: One (1) full year on all parts and labor (second year extended warranty available)

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 ComboPlus is a registered trademark of AST Research, Inc.

Quadboard is a registered trademark of Quadram Corporation.
 EISA is a registered trademark of EISA Europe.
 ALLHOME is a registered trademark of Techmar, Inc.

A Comparison of Programs for Personal Finance Management

This chart compares the features of the three programs reviewed in this article.

	Personal Computer/ Personal Finance Program Best Programs	Home Finance Program Design Data Systems Corp.	Home Budget Program Howe Software
List Price	\$95	\$100	\$59.95
Number of income categories	5	1	16 (9 as delivered)
Number of expense categories	40	13	48 (35 as delivered)
Number of entries per month	200 single-sided disk 400 double-sided disk	Not specified	100 income 210 expense
Tax-deductible categories	9	1	9
Credit card balance?	Yes	No	No
Split transactions?	Yes, automatically	Yes, manually	Yes, manually
Checkbook reconciliation?	Yes	Yes (double-entry req'd)	No
Function keys used?	Limited use	Limited use from menus	No
Display by month?	Yes, full information	Yes, without categories	Yes
Display by category?	Yes, full information	No	Yes, without payee
Cash flow indication?	Yes, with bar graphs or printouts	No	Yes
Budgeting?	Yes, by month, year or category	Yes, by category	No
Must enter months in consecutive order?	Yes	No	No
Enter checks and deposits in same module?	Yes	No	No
Loan amortization calculation?	No	Yes	No
Return on investment calculation?	No	Yes	No

they might suffice. The Design Data product is a sharply limited budget analyst that makes little use of the computer's

THE ELECTRONIC checkbook is the heart of the Best program.

mathematical abilities. It is distinguished only for including loan amortization and return on investment calculation rou-

tines. Howe's Home Budget Program is a rudimentary budget minder with minimal checkbook features.

Personal Computer/Personal Finance Program v.1.1.
Best Programs
P.O. Box 2370
Alexandria, VA 22301
(703) 549-3663
List Price: \$95

Requires: 64K, BASICA, one disk drive, monochrome or color/graphics adapter, monochrome or color monitor. (Printer recommended.)

Best's product is first-class all the way.

The instruction manual is well written and attractively presented. The volume is packaged in a binder and slipcase like IBM instruction documents, the text is set in type and printed in two colors, and the manual's table of contents and index are everything they should be. This level of quality is considerably more than most software companies provide, especially for a product with a list price of only \$95. Any company looking to sell to the personal computer market should take Best's whole package as a model—this is the way it should be done!

Best also provides user response cards in its manual, and promises to provide a newsletter for users; at least one edition

INCOME & EXPENSE DISTRIBUTION

JANUARY				CATEGORY		1982 YEAR-TO-DATE				
Budget	%	Actual	%	#	Name	#	Actual	%	Budget	%
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
4,000.00	93.7	4,000.00	77.2	2	PAYCHECK	2	4,000.00	77.2	4,000.00	93.7
100.00	2.3	109.75	2.1	3	DIVIDEND	3	109.75	2.1	100.00	2.3
150.00	3.5	400.00	7.7	4	BONUS	4	400.00	7.7	150.00	3.5
20.00	0.5	23.43	0.5	5	INCOME 1	5	23.43	0.5	20.00	0.5
0.00	0.0	650.00	12.5	6	INCOME 2	6	650.00	12.5	0.00	0.0
<hr/>										
4,270.00	100.0	5,183.18	100.0		INCOME		5,183.18	100.0	4270.00	100.0
<hr/>										
10.00	0.2	4.50	0.1	7	BANK CHG	7	4.50	0.1	10.00	0.2
50.00	1.2	50.00	0.9	8	CHURCH	8	50.00	0.9	50.00	1.2
900.00	21.1	900.00	16.8	9	H PYMT 1	9	900.00	16.8	900.00	21.1
150.00	3.5	104.50	1.9	10	H PYMT 2	10	104.50	1.9	150.00	3.5
650.00	15.2	650.00	12.1	11	FED TAX	11	650.00	12.1	650.00	15.2
250.00	5.9	250.00	4.7	12	SOC SEC	12	250.00	4.7	250.00	5.9
125.00	2.9	72.23	1.3	13	ELECTRIC	13	72.23	1.3	125.00	2.9
75.00	1.8	183.45	3.4	14	GAS	14	183.45	3.4	75.00	1.8
20.00	0.5	22.63	0.4	15	WATER	15	22.63	0.4	20.00	0.5
40.00	0.9	68.93	1.3	16	TELEPHONE	16	68.93	1.3	40.00	0.9
40.00	0.9	0.00	0.0	17	LAWN SVC	17	0.00	0.0	40.00	0.9
75.00	1.8	17.00	0.3	18	HOU MAINT	18	17.00	0.3	75.00	1.8
75.00	1.8	75.00	1.4	19	SCHOOL 1	19	75.00	1.4	75.00	1.8
0.00	0.0	0.00	0.0	20	SCHOOL 2	20	0.00	0.0	0.00	0.0
150.00	3.5	150.00	2.8	21	LIFE INS	21	150.00	2.8	150.00	3.5
50.00	1.2	50.00	0.9	22	MED INS	22	50.00	0.9	50.00	1.2
75.00	1.8	75.00	1.4	23	GEN INS	23	75.00	1.4	75.00	1.8
25.00	0.6	101.68	1.9	24	MED EXP	24	101.68	1.9	25.00	0.6
25.00	0.6	65.50	1.2	25	GEN EXP	25	65.50	1.2	25.00	0.6
400.00	9.4	444.61	8.3	26	FOOD	26	444.61	8.3	400.00	9.4
60.00	1.4	98.98	1.8	27	FURNITUR	27	98.98	1.8	60.00	1.4
100.00	2.3	149.58	2.8	28	H IMPROV	28	149.58	2.8	100.00	2.3
50.00	1.2	149.90	2.8	29	CLOTHING	29	149.90	2.8	50.00	1.2
25.00	0.6	30.00	0.6	30	NEWS/MAG	30	30.00	0.6	25.00	0.6
25.00	0.6	35.00	0.7	31	BOOKS	31	35.00	0.7	25.00	0.6
20.00	0.5	35.00	0.7	32	SPORTS	32	35.00	0.7	20.00	0.5
50.00	1.2	98.89	1.8	33	TRAVEL	33	98.89	1.8	50.00	1.2
50.00	1.2	50.00	0.9	34	RECREATH	34	50.00	0.9	50.00	1.2
100.00	2.3	548.25	10.2	35	INVESTMT	35	548.25	10.2	100.00	2.3
100.00	2.3	349.24	6.5	36	COMPUTER	36	349.24	6.5	100.00	2.3
25.00	0.6	35.45	0.7	37	TOYS	37	35.45	0.7	25.00	0.6
300.00	7.0	300.00	5.6	38	CASH	38	300.00	5.6	300.00	7.0
100.00	2.3	114.25	2.1	39	FORO	39	114.25	2.1	100.00	2.3
75.00	1.8	85.25	1.6	40	DLOS	40	85.25	1.6	75.00	1.8
0.00	0.0	0.00	0.0	41	OTHER	41	0.00	0.0	0.00	0.0
0.00	0.0	0.00	0.0	42	OTHER	42	0.00	0.0	0.00	0.0
0.00	0.0	0.00	0.0	43	OTHER	43	0.00	0.0	0.00	0.0
5.00	0.1	8.20	0.2	44	CARD FEE	44	8.20	0.2	5.00	0.1
<hr/>										
4,270.00	100.0	5,373.02	100.0		EXPENSE		5,373.02	100.0	4270.00	100.0
<hr/>										
0.00		-189.84			CASH FLOW		-189.84		0.00	

Figure 2: Budget report for current month and year-to-date generated by Best Program's Personal Computer/Personal Finance Program.

has already been sent out. Version 1.1 of the program, which came out in November 1982, included some changes suggested by users.

Features

Inside the program itself is a wide range of features, including an electronic checkbook which can produce monthly or yearly reports of all purchases and earnings, or can breakout reports by category. It will also tell you if you are spending more in a particular budget category than you had planned. The program can

maintain a running balance for credit card transactions, too. And Best's program will even produce bar charts showing cash flow, checking account balance, and budget performance on a video screen.

The program is not copy-protected. The manual's clear instructions walk you through the steps of setting up a master disk. The text makes the proper distinctions between single- and double-sided disks and between DOS 1.0 and DOS 1.1 systems. It is necessary to add BASICA and DOS to the master disk.

The program appears to be well designed, with much thought given to error-trapping and screen messages. All function selections are made from menus

DESIGN DATA'S program offers a module that calculates the return on an investment.

that branch from the main module. Limited use is made of the PC's function keys in some editing procedures. The program also allows you to switch manually between the monochrome and the color/graphics adapters if both are present in your system.

The program's source code is not protected, so it would be possible for a learned user to alter it for personal use.

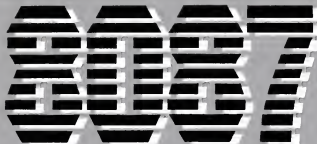
At the start of using the Best program, you have the opportunity to establish five income source and 37 expense categories. Three additional categories, making a total of 45, are permanently assigned by the program. Income categories for a two-paycheck family might be: Salary #1, Salary #2, Interest and Dividends, Sale of Assets, and Miscellaneous Income. As part of each transaction you enter the category by its number only, but when the program prints out charts, these will list the full title you have given to each subdivision.

Single-sided disks will accommodate as many as 200 entries per month; a double-sided disk can handle about 400 monthly entries.

Next, you have the choice of assigning a monthly amount for each of the categories.

Electronic Checkbook

The electronic checkbook is the heart of the Best program. You are asked to enter a type of transaction (check, deposit, credit card charge, interest, or the like), the applicable user-defined category number, an amount, the name of the payee or a description of the transaction, and the date. Entering an asterisk and a number in the payee/description column will



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- HMOS II 8088 Processor
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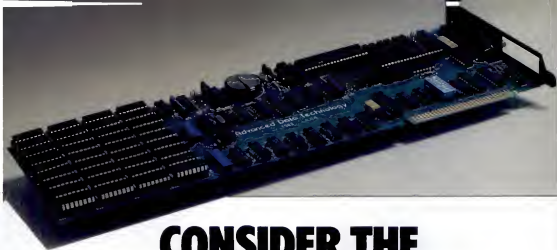
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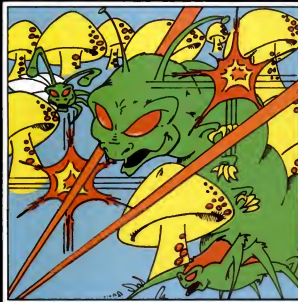
CIRCLE 102 ON READER SERVICE CARD

INCOME, EXPENSE, AND BUDGET SUMMARY FOR 12 MONTHS ENDING JAN 1982

MONTH	14 GAS	15 WATER	16 TELEPHONE	17 LAMM SVC	18 HOV MAIN	19 SCHOOL 1	SCH 2	43 OTHER	44 CARD FEE	45 CARPORT	46 CARPORT	47 TOT INC	48 TOT EXP	49 CASHFLOW
1) JAN	183.45	22.43	68.93	0.00	17.00	75.00	0.00	0.00	8.20	300.10	26.00	5183.18	5373.02	-189.84
2) DEC	196.24	18.00	40.00	0.00	84.52	75.00	0.00	0.00	10.00	0.00	52.02	4320.00	4353.70	-33.70
3) NOV	135.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	7.50	0.00	52.02	4325.00	4091.26	233.74
4) OCT	94.00	20.00	40.00	40.00	75.00	125.00	0.00	0.00	5.00	0.00	52.02	4200.00	4266.76	-66.76
5) SEP	75.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	5.00	0.00	52.02	4360.00	4375.00	-15.00
6) AUG	75.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	0.00	0.00	52.02	4260.00	4410.00	-150.00
7) JUL	45.25	45.21	46.34	45.50	78.85	75.00	0.00	0.00	15.00	62.25	52.02	4445.25	4694.44	-249.19
8) JUN	65.00	35.00	72.25	55.00	75.00	75.00	0.00	0.00	15.00	0.00	52.02	4470.00	4290.06	179.94
9) MAY	75.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	0.00	0.00	52.02	4270.00	4071.95	198.05
10) APR	87.00	15.00	34.65	40.00	50.00	75.00	0.00	0.00	3.50	22.50	52.02	4275.00	4120.76	154.24
11) MAR	109.50	25.00	56.75	45.00	95.00	75.00	0.00	0.00	4.35	75.00	71.02	4560.00	4438.99	121.01
12) FEB	142.45	15.25	34.98	0.00	54.25	75.00	0.00	0.00	0.00	102.52	42.46	4312.50	4271.12	39.38
13) TOT	1276.89	276.09	559.92	385.50	829.62	950.00	0.00	0.00	73.75	562.37	607.46	52980.93	52759.06	221.87
14) AVE	106.41	23.01	46.66	32.13	69.14	79.17	0.00	0.00	6.15	46.86	50.64	4415.08	4396.59	18.49
15) BUD	75.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	5.00	0.00	0.00	4270.00	4270.00	0.00
16) YTD	183.45	22.43	68.93	0.00	17.00	75.00	0.00	0.00	8.20	300.10	26.00	5183.18	5373.02	-189.84
17) YTD	75.00	20.00	40.00	40.00	75.00	75.00	0.00	0.00	5.00	0.00	0.00	4270.00	4270.00	0.00
BUD-JAN	-108.45	-2.43	-28.93	40.00	58.00	0.00	0.00	0.00	-3.20	-300.10	-26.00	-913.18	-1103.02	189.84
YTD-YTD	-108.45	-2.43	-28.93	40.00	58.00	0.00	0.00	0.00	-3.20	-300.10	-26.00	-913.18	-1103.02	189.84

Figure 1: Excerpts from a 12-month income, expense, and budget summary report generated by Best Program's Personal Computer/Personal Finance Program.

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CIRCLE 145 ON READER SERVICE CARD

PC MAGAZINE 98 FEBRUARY 1983



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pay when you include paychecks in your system.

Reports

Once all of the entries have been recorded in the electronic checkbook, the program is ready to really show its stuff. Your options include:

- Reviewing all of the entries in a particular category for the current month, the current year to date, or a prior year. If you ask for a listing of category 13 (Electric), you'd see a listing of checks, dates, payees, and comments, together with their total on the video screen, or printer, or both.

- Examining all listings identified as tax-deductible. You are allowed as many as nine such categories. The program will list all information from any or all of them, again for either the current month, the year to date, or for a previous year.

- Displaying bar graphs on the screen. These can depict cash flow (whether you took in more than you spent in a particular month); budget performance (how much over or under your budget predictions you were for each category); a category by category review of expenditures or income for a 12-month period; and your checkbook balances for a 12-month period. On a color monitor, the display shows black bars for positive numbers and deficit-red bars for negative numbers, set against a blue background.

- Printing out a comprehensive chart of income, expenses and budget performance for a 12-month period (see Figures

**SOME USERS
expect nothing more
than a computer-
assisted calculator to
help balance a
checkbook.**

1 and 2). The chart shows month-by-month totals for all 45 income and expense categories, which are identified by title and number. It also includes for each category a total for the year, a monthly average, and for comparison, the

3. AUTOMOBILE EXPENSES			
a. Datsun maintenance	\$30.00	\$12.00	\$18.00
b. Pontiac maintenance	\$40.00	\$34.00	\$6.00
c. Datsun auto loan	\$320.00	\$320.00	\$0.00
<hr/>			
Totals:	\$390.00	\$46.00	\$344.00
<hr/>			
4. CLOTHING			
a. Clothing	\$100.00	\$45.00	\$55.00
<hr/>			
Totals:	\$100.00	\$45.00	\$55.00
<hr/>			
5. ENTERTAINMENT			
a. Entertainment	\$50.00	\$89.00	-\$39.00
b. Restaurants	\$200.00	\$35.00	\$165.00
c. Misc. Entertainment	\$50.00	\$54.00	-\$4.00
d. Cable television	\$17.50	\$17.50	\$0.00

Portion of sample monthly report of Design Data Home Finance Program

Figure 3: Excerpt from a monthly expense report generated by Design Data's Home Finance Program. Columns of figures are for budgeted amounts, actual amounts, and their differences.

projected budget amount for the category.

- Reconciling your electronic checkbook (or written check register) with the bank's statement, using a convenient fill-in-the-blanks display or printout.

The program treats the IBM PC printer and the Epson MX-80 or Epson MX-100 dot matrix printers as default devices, but instructions are included for generating the charts on any PC-compatible printer. The charts are formatted as 80 columns of condensed print; you also can choose 136 columns of regular printing or 233 columns of condensed print for a wide-carriage printer such as the MX-100.

Best's Shortcomings

Even with the very impressive performance of the Best software, all is not perfect.

The procedure for making corrections in checkbook entries can be frustratingly slow: changes are made one line at a time, and the program pauses after each change is entered to recalculate a balance.

The program does not make it easy to

start keeping records in July and then add date later for the previous months of the year. You must have already set up dummy records with zero balances for earlier months before working on July. This procedure is not covered in the manual.

Also, if you choose to maintain two completely separate checkbooks (and most households with two breadwinners have two or more accounts) you must maintain separate date and program disks for each account; again, this is a point not covered in the manual. Separate disks are required because the program stores all the current month's data as well as the summary tables for the past 12 months on the program disk.

When you sign on and enter the command to add entries to an existing month's register, the program does not automatically give you an indication of the last withdrawal or deposit made. You'll have to retrieve this data by scanning the electronic checkbook's listing or keep a note in your written register that marks your place.

And a final minor quibble. The design-



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er of this program went to the trouble to include a series of bar graphs for cash flow and other indicators, but did not provide for producing hard copies of these graphs on a graphics-capable printer. It might be asking a bit much of a \$95 home finance program to include this capability, but then again, this program seems to sound every other bell and whistle, so why not this one as well?

THE PROGRAM allows easy splitting of a transaction between two or more expense categories.

Home Finance Program
Design Data Systems Corp.
5270 N. Park Place N.E.
Cedar Rapids, IA 52402
(319) 373-1571
List Price: \$100

Requires: 64K, BASICA, one disk drive, monochrome or color/graphics adapter, monochrome or color monitor. (Printer recommended.)

The Home Finance Program from Design Data Systems Corporation provides a simple spreadsheet for a household budget. It will reconcile your checkbook with a bank statement, but only after you laboriously re-enter all of the checks reported by the bank. The electronic checkbook does not allow you to apportion expenditures to budget categories. Deposits and withdrawals are entered in separate operations, and no running balance is shown on the display.

Features

Design Data's program does offer a few distinctive features. It includes a module called "Savings Account Analysis" that calculates the return on an investment. The program does more than its name suggests. You could also use it to calculate the return on a Certificate of Deposit, a fixed-yield bond, certain annuities, and other financial instruments as well. When you enter three out of four variables, the

computer will display or print the results calculated for each compounding period along with a total. The four possible variables are: amount of original principal, annual rate of interest, duration of the deposit, and the amount of principal that will have accumulated at the end of the calculation period.

Another module, called the "Loan Amortization Program," can tell you the total cost of a loan or the amount of each payment.

These features are nice for occasional use, but they are not very impressive. These relatively simple bits of programming are included in many BASIC instruction books.

Budget Analysis

The heart of Design Data's system is its "Budget Analysis Program." This module presents 14 pre-defined categories, including shelter, food and groceries, automobile expenses, clothing, entertainment, contributions, insurance premiums, and medical bills. An additional category is titled "vices." Changing the names of the subdivisions would require an excursion into the BASIC source code. Under each category, though, you can add as many as 10 subcategories. For example, the "shelter" listing might include payments for mortgage or rent, electricity, gas, home improvements, and repairs.

The next step in the budget analysis process is to assign expected amounts for each of the sub-categories you've chosen. The program will prompt you line by line to input each estimated dollar amount.

With all that data entered and stored away on your separate data disk, you are ready to record the actual expenditures for each month. Here you're going to have to rely on paper and pencil, or a separate calculator, since the program does not add each new item to the total in a category. Say you have paid out six checks during the month for medical bills. You'll have to separate them, record them manually, and total them up so you can enter a single figure into the budget. You can make as many changes to the budget listing as you'd like, but each new entry will wipe the slate clean.

And then finally, you can ask the program to prepare a report (see Figure 3) that compares the actual expenditures for a particular month (or other period of time)

Software Breakthrough...

NEW

NEW QUIKPRO + PLUS WRITES PROGRAMS FOR YOU IN MINUTES ON YOUR Micro

Technical Review
by Wayne Hepburn

QUIKPRO + PLUS is a new breakthrough in software for microcomputers from ICR-FutureSoft.

Until now, whenever you wanted a new separate program in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic), you had to spend a lot of dollars for it, or a lot of hours creating it (if you have the know-how). That's all in the past now.

Anybody who can turn on a computer can write a program, quickly, with this new Quikpro + Plus software which generates programs for you. Quikpro + Plus is the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you to tap the real power and speed of your microcomputer, and it is about time this happened.

I interviewed him to find out more about Quikpro + Plus and pass this valuable information to you. He told me "The best part of this software is that it gives you a separate custom program every time you use it. The resulting program is produced, error-free, in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic, as appropriate to your system) for you by Quikpro + Plus. What's more, you can list your new program, look at it, see what makes it tick, and modify it as you wish."

You can also, customize, enhance, alter, and even copy the programs you create with Quikpro + Plus. This is because programs created by Quikpro + Plus are structured, easy to follow, and include many REMARKS statements right in the program listing. I don't know of any other software with the flexibility and ease of use I found in Quikpro + Plus.

HUNDREDS OF APPLICATIONS...

For Education, Business, Hobby, Home, Science, Personal, etc. a partial list includes programs like these: Financial Forecasting, Expense Planning, Data Access and Retrieval, Modeling, Record Keeping of all kinds, Statistical Data Banks, and much, much more. Quikpro + Plus cuts the time it takes to generate a new custom program down to a few minutes. That's true. I saw a

letter from a user who created a separate program in Basic within fifteen minutes after reading the clear, simple, complete Documentation & Operating Manual for Quikpro + Plus. The software will generate File Handling and Data Entry Programs in a file format, drawn right on the screen by user. Programs created by Quikpro + Plus produce standard ASCII Data Files allowing data to be easily accessed by other programs, other micro's, and even main frames.

HOW IT WORKS...

The operation of Quikpro + Plus is simple and easy. On your screen you answer questions which appear in plain English. The answers generate error-free Filing & Data Entry Programs for you...instantly. This completely eliminates the tedious and time consuming development you normally go through to write a program. Since the instructions are right on the screen you don't need any programming skills to operate Quikpro + Plus. Quickly, you get a fully independent new program ready to run on your system. After you create the new program you can remove Quikpro + Plus and stick it on the shelf until the next time you create a custom program.

PRINTS REPORTS & MANUALS...

There is a full report printing capability put into your new separate program by Quikpro + Plus. You can even print out in formats different from the File Format you used without altering the Record Data. Or you can selectively print portions of Files or selected fields from selected Records. Just about anything you want can be reported out from the Data Base associated with the new custom program you wrote.

PERFORMS CALCULATIONS...

You can perform all manner of computations among various fields in each record. You can selectively calculate and print resulting data only, or Data Base and results, or alter Records by calculation results, and so forth. The possibilities seem unlimited. And keep in mind that the power and features I am talking about end up in the separate new custom program Quikpro + Plus writes for you.

This software is ready to ship immediately

and you can start writing programs the day you get in. In fact, ICR-FutureSoft guarantees your satisfaction or you can return it for a full refund in ten days after delivery. How's that for confidence? Mr. Tamargo said "There isn't any risk to us...our product works like it's supposed to work and users are very well satisfied. We are glad to guarantee satisfaction."

You get Quikpro + Plus by mail or phone directly from ICR-FutureSoft. Just write them, or call their Toll-Free phones and specify your model and version requirements from the list that follows:

For CP/M with Microsoft Basic \$259
(same as MBASIC/Basic 80)

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Radio Shack TRS80 Mod I, III \$149
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Figure 4: Monthly summary report of income and expenses generated by Howe Software's Home Budget Program.

Summary of Income for Month 11 Year 1982		
Code	Income Source	Total Amount
1	Salary	\$2,750.00
2	Salary	\$2,351.00
3	Book royalties	\$875.23
4	Magazine articles	\$1,275.00
5	Sale of Assets	\$235.00
6	Interest earned	\$167.82
7	Reimbursements	\$23.89
8	Other income	\$75.00
Total Income		\$7,752.94

Summary of Expenses for Month 11 year 1982		
Code	Expense	Total Amount
1	Food	\$156.73
2	Meals	\$98.75
3	Rent or Mortgage	\$720.00
4	Interest	\$65.70
5	Home improvements	\$650.00
6	Home Maintenance	\$45.00
7	Household Goods	\$6.23
8	Home Insurance	\$125.00
9	Electricity & Gas	\$137.84
10	Telephone	\$37.82
11	Income Taxes	\$0.00
12	Property & School Tax	\$0.00
13	Other taxes	\$0.00
14	Auto Purchase	\$320.00
15	Gasoline & Oil	\$0.00
16	Auto Maintenance	\$0.00
17	Auto Insurance	\$0.00
18	Misc. Auto Expenses	\$89.53
19	Other Transportation	\$0.00
20	Clothing	\$0.00
21	Doctors & Dentists	\$0.00
22	Hospital Care	\$0.00
23	Medicine & Lab Tests	\$0.00
24	Personal Care	\$7.50
25	Education	\$0.00
26	Child Care	\$0.00
27	Pets & Hobbies	\$0.00
28	Life Insurance	\$0.00
29	Entertainment	\$67.50
30	Travel	\$0.00
31	Books & Subscriptions	\$35.00
32	Dues	\$0.00
33	Charity Contributions	\$25.00
34	Gifts	\$0.00
35	Other Expenses	\$0.00
Total Expenses		\$2,587.60

Income exceeds expenses by \$5,165.34

Sample monthly printout from Howe Home Budget Program

to the predicted budget amounts.

Design's Problems

There were some serious problems with operating the program. To begin with, it is very easy to strike the F1 function key accidentally while in the budget mode. The program then eliminates all of your budget subcategories without even asking you a fail-safe "Are you sure?" question. A similar problem is that entries are recorded to the disk only when you choose to exit one module into another—this procedure gives you many opportunities to crash the program and lose all work that was done since you last signed on.

The budget category listings zip by on the screen—the only way you can halt them long enough to read them is by quickly punching the Ctrl-Num Lock combination. And, the program does not offer you the choice of printing while in the budget module. You can try to catch a screenful at a time using the PrtSc key, but it was very difficult to get a full printout this way. It might be relatively easy to use an LPRINT statement to add printing capabilities to the program. If you're proficient in BASIC you could go into the source code and make the fix yourself.

Error trapping throughout the program was minimal—the usual response to errors was to bomb out of the program to BASIC, which is a bit of a disaster if your recent entries have not been stored.

The instruction manual for the program has a lot of phrases such as "Simply enter . . ." and "Simply press . . ."—the fact is that operation of this program is not simple, and its instructions are not very simply presented. The manual does not provide any instructions on setting up a master disk or on how to make back-up copies of the program, even though the software is not copy protected. Interestingly, the program disk that was sent to me for review already contained IBM's PC-DOS plus BASIC and BASICA. This is not the usual practice of independent software developers. However, there should be no reason that both BASIC and BASICA (Advanced BASIC) would be required on the same disk, since the advanced version of the language is supposed to support all programs which use lesser versions.

Another puzzle involves Design Data's unusual opening instructions: "MAKE

SURE THE COMPUTER IS OFF!!! Insert the Program Disk with the hole to the back of Drive A, and with the label up. **DO NOT TURN ON COMPUTER UNTIL AFTER TEST HAS BEEN INSERTED!!!!**

There doesn't seem to be any reason to avoid using the Ctrl-Alt-Del reset or loading the program manually from DOS. It does your computer no particular good to

modest in title, for it only consists of a budget charting and a record-keeping function. The Home Budget Program is very earnestly presented by its competent, but slim, manual.

The program is not designed as an electronic checkbook, but it could be a complement to a handwritten register of checks. You cannot include budget predictions; the program merely totals the expenditures and income assigned to the various budget categories each month.

The software requires the inclusion of BASIC; and the instruction manual gives adequate instruction in preparing a master program disk. The software is not copy protected. Back-up copies for damaged original disks are offered for \$2 plus a diskette. Users are invited to write or call when they have problems.

Features

As delivered, the Home Budget Program includes nine income categories and 35 expense categories. The income categories correspond to the requirements of the 1040A tax form, which is a thoughtful touch. Any or all of the categories can be changed by the user, and the number can be expanded to a total of 16 income and 48 expense subdivisions if desired. Nine of the expense categories are flagged as tax deductible.

The program can handle 100 income and 210 expense entries per month, but the manual advises that the program can be altered to take advantage of systems which have more RAM than the minimum 64K required by the software.

Expense entries can be limited to checks or can be more broadly defined to include cash outlays and credit card charges. These are entered with the date, an optional check number, a category number, and the amount. There is no provision for indicating the name of the payee or the nature of the expenditure other than through the category number.

Access to entries for editing is done by specifying the item number that had been assigned by the program when an expense or income item was entered. Withdrawals and expenses are entered by procedures from separate modules.

The only function that is left to do is to compute monthly or yearly totals. The program will produce a summary of income and expenses on the screen or a printer. The code number, category name

and total are listed, along with an asterisk to indicate tax-deductible categories (see Figure 4). The yearly totals also include a monthly average for each category.

Home's Bugs

The disk I used for this review had several minor but annoying bugs. The computer was thrown into an endless loop when an error was made in naming budget categories, and in certain functions the program bombed out and displayed a BASIC field overflow message. The program also failed to operate properly with a two-disk system; it crashed regularly whenever it didn't find the file it was supposed to be looking for on one drive or the other. I asked the program's author, Hubert S. Howe, Jr., about these problems. Howe tracked down the errors and said that apparently they arose because of a problem in duplicating the disks. He promised that corrections would be made for present and future owners of the program.

The Bottom Line

The bottom line for these three financial programs is that you don't always get what you pay for—in one instance you get much more and in other cases you get much less.

If Best Software's Personal Computer/Personal Finance Program was offered for \$395, it might be worth making an argument for purchasing the simple and modest Howe Home Budget Program for only

**IT WILL TELL
you if you are
spending more in a
particular budget
category than you
had planned.**

\$59.95—assuming that its bugs had been eradicated. (Design Data's unimpressive offering goes for \$100 a copy.)

But the fact is that for only \$95, Best Programs offers a superior package in all respects. Best is the best of this lot. /PC

THE PROGRAM will produce a summary of income and expenses.

turn its power supply off and on each time you want to load a different program.

The program also seems to conscientiously rule against the possibility of using a two-disk system. It will not allow simultaneous use of the program disk in Drive A and a data disk in Drive B. This can become a bit of an annoyance since some program modules require frequent disk swapping.

The program's instruction manual and on-screen prompts could have benefited from the use of a spelling checker program, or at least a perusal of Webster's Collegiate Dictionary. The opening menu offers you "Loan Amortization," and an all-important group of categories is flagged as tax "deductible."

All in all, this personal finance program rates a judgement of "So what?" It's not an electronic checkbook, it requires you to calculate your own totals for expenditure accounts, and it doesn't maintain records with much useful detail.

Home Budget Program
Howe Software
14 Lexington Road
New City, NY 10956
(914) 634-1821
List Price: \$59.95

Requires: 64K, BASIC, one disk drive, monochrome or color/graphic adapter, monochrome or color monitor. (Printer recommended.)

This offering at least is appropriately

The PC can't print money, but with the right software, you can keep track of where it is and where it's gone.

Five Financial Programs For The Home

Personal finance management programs are among the hottest selling types of software for the PC. Many people who puzzle over whether or not to purchase a personal computer settle the matter by telling themselves, "I'll get it to balance my checkbook. And, it will pay all the bills and take care of the taxes." These applications sound so practical that they serve as sensible, irrefutable arguments in favor of acquiring a computer. It seems guaranteed that if you bring a PC home and load in the right software, you'll never again have to worry about the financial side of life.

Many programs claim to fulfill the above financial fantasy. Five of these products are reviewed in this article: Money Maestro, Home Accountant Plus, Bonus Accounting System, FMS II, and Financier Personal Series. Before thinking about which of these programs is the best for you, consider the following general question.

Will a computerized personal finance management system really save you time and money? Large corporations and many smaller businesses use computerized accounting methods because they handle so many transactions that economies of

scale result in a significant payoff. But few individuals or families handle a quantity of financial transactions large enough to make it noticeably easier to use a computer rather than a handwritten bookkeeping system. Most people would have to use a system for quite some time before it provided enough savings and tax reductions to pay off the cost of the system's hardware and software.

Apart from their cost, personal computers still have the advantage of novelty. If you've never before kept even your checkbook up to date, the excitement of using your own computer may motivate you to organize your financial records into a workable system for the first time. If you already pride yourself on maintaining meticulous financial records, a computerized system may offer you the satisfaction of maintaining even more detailed records. Some of these programs enable you to produce sophisticated graphs that could make your family's Christmas letter look like a corporation's annual report.

When considering whether a personal finance management program is right for you, the most important question to ask yourself is "Will I actually use it?" An accounting system is only as good as the





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will make you slide happy

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A Comparison of Personal Finance Management Software

The capacities and capabilities of the five programs reviewed here are consolidated in this chart.

	Maximum Budget Categories	Transactions Per Disk (160K)	Integ Chec Acco
Bonus Accounting System The Programming Shop 1164 Umbarger Road San Jose, CA 95121 (408) 226-2157 List Price: \$150	None	Unknown	Any num
Financier Personal Series Financier, Inc. 11 Flanders Rd. Westboro, MA 01581 (617) 366-0950 List Price: \$190	32,000	1,200-1,500	32,000
FMS II Computerized Management Systems 1039 Cadiz Dr. Simi, CA 93065 (805) 526-0151 List Price: \$89.95	100	Unknown	Any num
Home Accountant Plus Continental Software 11223 Hindry Los Angeles, CA 90045 (213) 417-8031 List Price: \$150	100	1,000	5
Money Maestro Innosys, Inc. 2150 Shattuck Ave. Berkeley, CA 94704 (415) 843-8122 List Price: \$200	Unknown	Unknown	1

information that goes into it. This part of the job is still your responsibility. If a system feels so complicated and difficult to use that you shy away from updating it consistently, it will be useless, regardless of its advanced features and capabilities.

The following points should be considered when evaluating a personal finance management program: What financial reports will it produce? What kinds of records can it maintain? What additional features does it offer? How easy is it to install and operate? And will the documentation tell you everything you need to know to make use of the program?

Financial Reports

The first feature to consider is whether a program will produce the kinds of financial reports you want. The reports you generate at the end of the month, quarter, and fiscal year are the main pay-

off for all the time you invest in setting up a system and recording information faithfully.

What kind of report do you need? Do you simply want to have a reconciliation of your checking account to compare with the bank's statement each month? Do you want an income and expense report? This may include a wide variety of financial information sorted into categories that are relevant for planning your budget and taxes. You could also set up a budget and produce a report comparing actual and budgeted amounts for each income and expense category.

Do you want to know how much you are worth? A net-worth statement can show you a complete picture of your accounts and personal property as assets and liabilities.

Each program produces different types of reports and presents them in a variety of ways. Reports can be comprehensive or focus on individual accounts, categories, and time periods. They can appear as

summaries or can include detailed listings of each transaction. The information can be presented as tables of numbers or be transformed into graphs and bar charts. Some reports can be printed or displayed only, while others can be presented both ways. Make sure that the program provides the reports you need and presents them in a format you can use.

Accounts and Categories

Next, see if the program will support enough files to keep track of all your accounts. Do you have one checking account or several? Do you want to keep track of charges on each of your credit cards? Are you paying attention to cash transactions in your budget as well? Do you plan to use the system to maintain records on the state of your saving accounts, loans, mortgages, and investments?

If you're keeping an itemized budget the program must be able to identify all your income and expense categories.

Categories Transaction	Tax Categories Per Transaction	Handles Credit Cards?	Prints Checks?	Includes Tutorial?	Multiple Distribution of Transactions?
	None	Yes, but not easily	No	Yes	No
	9	Yes	Yes	Yes	Yes
	1	Yes	Yes	Yes	Unknown
	Tax deductible flag only	Yes	Yes	No	Yes, but not easily
	1	Yes	Yes	Yes	No

When you receive your paycheck, will you be satisfied with being able to list only the net amount as a deposit to your checking account, or do you want to separate the gross amount into several categories to identify all the deductions for

THE MANUAL
for the Financier
Personal Series does
the best job of
explaining accounting
principles.

axes and benefits? In various programs, these categories can be identified either by their names, by code abbreviations, or by numbers from a chart of accounts.

These categories can be sorted to organize items into budget categories or into groups that are convenient for preparing your tax forms. Some programs allow you to indicate the tax attributes of categories or individual items. One of the programs, the Financier Personal Series, is designed to produce data disks that are compatible with the manufacturer's tax software package.

Special Features

These programs include some features that supplement their basic record keeping and report generating functions. A forecasting module is included in the Home Accountant Plus. It calculates the effects of interest rates and inflation over different periods of time.

All of these programs, except the Bonus Accounting System, include a check writing function. This instructs the printer to fill out a pre-printed check form. Some allow checks that you write regularly to be generated automatically

each month. The checks are provided in perforated, fan-folded sets. Some programs can use only one type of check, while others can be adapted to fit the check format of your choice.

The check writing features may not save you much time and effort if you only write a few checks at home each month. Even so, you might enjoy the prestige of using a computer to pay your bills.

Operations

The procedure for creating a set of working disks is roughly the same for all

HOME
*Accountant Plus is
especially geared to
producing graphic
displays of your
financial information.*

five software packages. Each requires that you use PC-DOS to format blank disks, copy files back and forth, and produce back-up copies of disks using DISKCOPY. Thorough instructions for these procedures are included in all the manuals, but novice users may be confused by these operations. Even IBM's Disk Operating System manual contains confusing explanations of the COPY and DISKCOPY functions. It is too bad that software manufacturers rarely tell users how to carry out file transfers by using PC-DOS's batch processing capabilities. Those procedures are much easier to carry out, and they reduce the risk of procedural errors destroying a program disk before it has been backed up. It is up to you to make back-up copies of data and to perform disk-filling checks. Neither of these precautions is handled automatically.

Once you are past the initial effort of setting up the accounts and budget categories for your accounting system, it's easy to enter data. All of the programs include features that speed up the entry process. For example, when you start to enter a new transaction, the text of the previous item is repeated so you can use any common information without keying



it in again. Automatic incrementing of check numbers is also a convenience.

Manuals and Documentation

The manual in a personal finance management software package should provide two types of information. It must include instructions on how to run the program and use its features. All the manuals tend to present this information in a sequence that follows the pattern of menus in the programs. The procedures involved in executing each menu item are explained. Most manuals include pictures of the menus and samples of screen layouts as part of the text. Only the Financier Personal Series includes an index. All five manuals are printed on good paper and held in sturdy loose-leaf binders. This packaging is a great improvement over the old standard of xeroxed pages of typed text stapled together and sealed in a zip-lock bag.

The manuals should also include an explanation of the theories behind the accounting systems. Unfortunately, these products generally lack this type of information. The manual for the Financier Personal Series does the best job of explaining accounting principles. Manuals explain how to initialize the names and amounts for categories in the program's budget tables. Most manuals, however, do not help determine which categories best fit your financial situation or how much money should be allocated to each budget category.

Most of these programs allow you to

maintain records for credit cards and home mortgages. The manuals, in explaining these items, usually tell only how to set up files, input and edit transactions, and produce reports. The instructions, for the most part, fail to answer important questions raised by these financial matters.

Consumers are likely to think that a credit card is equivalent to a checking account. If they are used to treating the account's credit limit like money in the bank, they might include that amount as the starting balance for credit card accounts included in their records. In usual accounting practice, a credit card account is treated as a checking account with a negative balance. Whenever you receive a statement for the account, you should subtract new purchases, service charges, and fees from a balance that started at zero. When you record payments, these amounts should be added to the negative balance to bring it back toward zero. Even if you understand this point, you still must figure out which categories in the accounting system are appropriate for credit card charges and which should be used to record payments.

How do you include your home mortgage in a personal finance system? This item is usually set up as a liability account with a large negative value. When you make mortgage payments, the portion that goes toward paying off the principal should be subtracted from this liability account. However, the part of the

payment that is used to pay interest charges cannot be subtracted from the same account; interest payments must be put into another category.

If you plan to produce a net worth report, you must remember to include the value of the house as an asset to offset the liability of its mortgage. But how do you find out the appropriate value to use for the house and property? Do you use the current market value, the original purchase price, or the original price plus the cost of financing? The personal finance management programs may provide you with a way to record information for these items, but they won't answer such questions for you.

Tutorials

Tutorials are included as a helpful supplement to the manuals in three of these programs. They provide step-by-step instructions that help you practice setting up the system by using sample data sheets, performing transactions, and printing reports. Home Accountant Plus has no tutorial, while FMS II only includes some sample data with no particular instructions.

Money Moestro
Innosys, Inc.
2150 Shattuck Ave.
Berkeley, CA 94704
(415) 843-8122
List Price: \$200

Money Moestro is a personal finance management program designed to maintain records for a single checking account. It also stores records of cash and credit

FMS II
*could be a bargain for
experienced
accountants.*

card transactions. The program can also store a budget that lists the amount you expect to spend in any month for each budget category you create. The tax attributes of each budget category can be identified by letter codes. As you record actual

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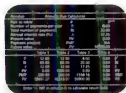
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transactions, their amounts can be assigned to any of the categories in the budget.

You can note that a check has cleared as part of the record for that transaction. This information is used when the program produces a checkbook reconciliation report. This report includes a list of

THE FINANCIER *Personal Series offers great flexibility and convenience in splitting a single transaction among several categories.*

cleared checks and deposits for the period, followed by a summary of the state of the account. Money Moestro can also be used to print checks on forms supplied by Checks-To-Go.

Money Moestro produces reports that compare the actual and budgeted amounts for each category, either for month-to-date or year-to-date. Transaction records can be sorted by budget category, name of payee, or tax attribute codes to produce a variety of reports. All these reports can be displayed or printed.

For the most part, Money Moestro manipulates your financial information by sorting routines like those used in a date base program. While this program can do some useful functions, don't expect it to perform sophisticated calculations like a spreadsheet program. Users unfamiliar with accounting methods should have no difficulty understanding the elementary theory behind the records and reports used in this program. The manual is easy to follow and the program includes a tutorial.

Home Accountant Plus is designed for monthly updates of financial records. It is especially geared to producing graphic displays of your financial information. The program can maintain five checkbooks, five cash accounts, and any number of credit cards. A budget can be set up to include as many as 100 categories. Disks store up to 1,000 transactions; additional disks store more transactions if necessary. The program disk sets up any number of separate account systems, so you could keep a set of accounting books for both your family and your small business.

The budget categories you invent are identified by numbers and classed as one of five types: Assets, Credit Cards, Liabilities, Income, or Expenses. Checkbooks and cash accounts are treated as categories of the Assets type, as are the value of your house, automobiles, and investments. The program does not specify the taxation status of budget categories. Individual transactions, however, may be labeled as tax deductible or not by typing a Y or N on the appropriate line of the screen for the record.

With Home Accountant Plus, you can perform split transactions, such as assigning the principal and interest portions of a loan payment to different budget categories. Carrying out this procedure requires considerable effort.

A cleared check can be flagged initially when the transaction is recorded, or later by editing the transaction record. A monthly checkbook reconciliation procedure is provided. You also have the

option of setting up five monthly automatic transactions for each checking account. This allows predictable amounts of payments, such as rent, insurance, and other obligations to be subtracted automatically from your balance at the beginning of each month. While this feature may help plan your financial life by reminding you to set aside money for these expenses, it could lead to some confusion because these deductions are entered whether or not you have written checks to make the payments. If you record the check also at the time you actually write it, the same payment might get subtracted twice from your account.

This program displays or prints check activity reports that show sets of transactions sorted by date or range of dates, name of payee, budget category, or any other criteria in the transaction records. Checks themselves are produced on pre-printed forms, supplied by Nebs Computer Forms, for any transactions that are already recorded.

Home Accountant Plus uses graphic displays to present financial reports. You can see the monthly status of each budget category over a 12-month range displayed as a bar graph comparing actual and budgeted amounts, a line graph of actual expenses, or a line graph showing a linear regression analysis of the historic trend of any budget category.

The program also prints (but does not display) the following reports as numerical data: a Budget/Actual comparison; a Personal Balance Sheet that shows the month's actual balances for each category.



Home Accountant Plus
Continental Software
11223 Hindry
Los Angeles, CA 90045
(213) 417-8031
List Price: \$150

ry, either alone or alongside the budgeted or the previous month's amounts for each category; and an Income and Expense summary for either one month or a series of months. A 132-column printer is required to produce the Budget/Actual report.

Apart from the record keeping and budgeting functions, this program includes a Forecast Module. You can calculate the results of various combinations of economic conditions and determine the return on an investment at a rate of interest over a period of years. You can also determine how much money must be invested each month to reach a savings goal within a given period of time. Further, you can tell how a given rate of inflation would affect the dollar equivalent of your present assets over the years. Displayed reports from the forecast module require a color/graphics adapter.

The manual presents instructions in an order that corresponds to the sequence of menus used by the Home Accountant Plus. Since no tutorial is included, you should look through the manual several times before using the program to become familiar with the program's capabilities and the menu sequences.

Though this program does not offer a true double-entry accounting system, it is complex enough to keep a record of any of your assets and liabilities. True to its purpose, Home Accountant Plus will help you answer the first question posed in the introduction to its manual: "How much are you worth?"

Bonus Accounting System
The Programming Shop
1164 Umbarger Road
San Jose, CA 95121
(408) 226-2157
List Price: \$150

The Bonus Accounting System is a personal computer version of a standard double-entry bookkeeping system. To use this system you must set up a Chart of Accounts with a category for each element in your financial life. These accounts are classified as debit accounts (the asset and expense categories) and credit accounts (liability, capital, and revenue categories).

In a manual double-entry bookkeeping system, whenever you record an increase



in one of the debit accounts, you also have to record a decrease in an account on the credit side and vice versa. Since each transaction is recorded on both sides of the Chart of Accounts, this accounting system is called "double entry."

BONUS *Accounting System automatically transfers the figure on one side of the ledger into an appropriate account on the opposite side.*

With the Bonus Accounting System, when you post a transaction on one side of the ledger, the program automatically transfers the same figure into an appropriate account on the opposite side. This feature should greatly reduce the time that must be devoted to maintaining a set of double-entry books. Information from the Chart of Accounts can be displayed or printed at any time.

As both sides of the Chart of Accounts are in balance after each transaction, the double-entry system is useful for determining your exact financial situation at any point in time. You can use Financial Reports Menu to produce a trial balance,

balance sheet, transaction history, current financial statement, and a year end financial statement. These reports can be printed only, not displayed.

The manual is easy to follow and includes a tutorial. A brief explanation of double-entry accounting is included in the manual. Anyone already familiar with double-entry accounting methods should have few problems with Bonus Accounting System. Users who are inexperienced with the theory and practice of double-entry bookkeeping can refer to any accounting textbook because the program follows standard procedures so closely.

FMS II
Computerized Management Systems
1039 Cadiz Dr.
Simi, CA 93065
(805) 526-0151
List Price: \$89.95

The Financial Management System II (FMS II) can maintain records for multiple accounts, including checking, savings, cash, and credit card accounts. The program also allows you to set up a budget. It can maintain different accounts on separate disks or, if preferred, distinguishes them by storing each set of account records on the same disk under individual file names.

File names can be up to eight characters long. The first three characters must identify the month; the remaining characters identify a specific account. For example, MARPCHK2 could be the file of transactions for second personal check-

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ing account for the month of March. Each file will hold 200 records, though only 120 records can be handled reliably by a PC with only 64K RAM.

FMS II makes use of macros, a feature not found in the other programs reviewed here. You can define lists of two types of

ANYONE
already familiar with
double-entry
accounting methods
should have few
problems with Bonus
Accounting System.

macros by using the System Utility module of the program. An item macro is a one-, two-, or three-character abbreviation that generates a longer name that will appear in the "Item" field of a transaction record. For example, the item macro "VDA" can represent the full name of "Valley Doctors Assn." Item macros reduce the number of keystrokes needed to enter data; they also produce names in standardized forms that can be sorted with greater consistency.

The code macros are one- to three-character abbreviations that represent eight-character code names. These codes set up budget categories and can group transactions into sets of different income sources, expense types, and tax classifications. Only one code macro can be used for each transaction, so this feature can't be used to indicate both the category and the tax status independently for individual transactions.

The Account Manager module of the program is used to set up files and for writing and revising transaction records. A transaction record includes six fields for data. The first field stores either a check sequence number (up to four digits long), the letter D to identify a deposit, or the letter C to indicate a bank charge. The second field is for the transaction date; you must key in the month, the day, and the year as separate entries. The third field is the item that can be entered by

typing a name in full or by using a short item macro that has been previously defined; when an item macro is used in this field, the program automatically enters the appropriate code macro into the sixth field of the record. The fourth field is an explanation; this text must be typed in without using macros. The fifth field is the amount of the transaction, which can be as great as \$99,999.99. The sixth field is a code that must be selected from the code macro list that was set up previously. The code macro serves a purpose similar to category names and numbers in other personal finance management programs.

Check clearance and confirmation of other transactions are indicated by pressing the Enter key; unconfirmed transactions can be passed over by pressing the spacebar. Confirmed records are automatically flagged with a # symbol.

After completing this procedure, reports of balances and unreconciled amounts for the account can be displayed or printed so that you may compare these figures with the bank's statement. The program will print checks on fan-folded forms. You can modify the check printing format to fit another style of pre-printed check if you choose.

FMS II sets up budgets for single months or for the entire year. It stores budgeted amounts for each category that has been defined by a code macro. The Account Auditor module sorts files of transactions into the code macro categories and calculates the total for each category. The screen displays a report for each category. The complete account audit report can only be printed, either in 80-column or 132-column format.

After completing an account audit, another report can be generated to compare the actual with the budgeted amounts for each category. The Search Records module searches either in a single file or the entire files disk for a record identified by the contents that you specify for one of the transaction record fields. There is also a Sort Records option in the Account Manager module that provides five different sort routines. Reports can be made from sets of records that are organized with these searching and sorting functions. Any of the above reports may be saved in memory, displayed, and printed.

The manual for FMS II provides thor-

ough explanations of the program operations. The manual feels, however, to provide any illustrations of the menus, screen displays, or printed reports that a user might encounter or produce with the program. It mentions nothing about accounting theory, nor does it offer any suggestions of how to organize financial information prior to operating the program. Some sample data is included in the program, but neither a tutorial nor the manual tells how to use these numbers to practice accounting operations. The program's operations are fairly easy, so you may learn the program better through trial-and-error sessions than from reading the manual.

FMS II offers little advice for setting up a personal bookkeeping system. If you know what you want to do, FMS II is sufficiently unstructured to allow you to organize it in a wide variety of ways. For example, the program doesn't specify whether the item or the explanation fields are used to store the name of the payee or to identify the item that was purchased. You could decide which of the two types of information would be best used with the item macro capability. Setting up new file names for each account every month provides flexibility, but would be bothersome for most users.

Its price is the lowest of the five programs reviewed here, so FMS II could be a bargain for experienced accountants who are excited by the availability of macros and aren't confused by open-ended versatility.

Financier Personal Series
Financier, Inc.
11 Flanders Rd.
Westboro, MA 01581
(617) 366-0950
List price: \$190

The Financier Personal Series is one software package from an integrated series of products. This program allows you to maintain records for any imaginable combination of accounts or budget, tax, and income source categories. The program permits as many as 32,767 accounts and categories, and a total of 32,767 items. In reality, of course, you are limited by disk space, because all data for a budget period (month, quarter, or year) must be stored on a single disk; you can store about 1,200 items on a 160K capac-

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ity disk. The program also allows you to set up a budget and a personal property inventory system.

The program processes three types of transactions: expense transactions (checks and credit card charges), income transactions (paychecks and dividends), and account transfers (a credit card payment made from a checking account). You may label transactions with both a category and tax designation selected from lists you have created. Even in the middle of entering a transaction record, it's easy to stop and refer to a list of existing categories or to create a new category.

***THE FINANCIER
Personal Series
includes one of the
most charming
messages ever to
appear on a personal
computer's screen.***

Of the programs reviewed here, the Financier Personal Series offers the greatest flexibility and convenience in splitting a single transaction among several categories. An expense transaction can be itemized for as many as nine categories. With this system you could record a check you wrote today at the supermarket and easily divide the total to show how much of it was for food, household supplies, and cash over the amount of purchase. A record of a loan payment can show how much went toward paying off the principal and how much was for interest.

The program divides income transactions into as many as nine parts, listed as deductions from the gross amount of the transaction. This capability should provide enough categories to keep track of all the deductions for tax and benefits on your paychecks.

You may edit transactions at any time. If an amount is changed or deleted, other totals and summary figures that include this number will be recalculated automatically. A checkbook reconciliation rou-

tine is included, as is a check printing system that allows monthly payments to be produced automatically.

The Financier Personal Series provides both screen displays and printouts of all transaction reports. These reports will cover any length of time within the period covered by the data disk. They can include details or summaries for sets of items sorted and selected by account, tax or budget category, or income category. The program also generates reports from the personal property inventory system; these records can be sorted in various ways.

The program does not provide a routine to use the ledger and the personal property inventory to generate a net worth statement. The manual, however, takes care to explain how you can use the program to find the data you need to organize the final report by yourself. It includes instructions that help you judge which accounts and categories in your system would be classed as assets or liabilities in a net-worth statement.

The Financier Personal Series includes one of the most charming messages ever to appear on a personal computer's screen. While the program is carrying out the laborious process of initializing a disk at the start of a new fiscal year, the following suggestion is displayed: "THIS COULD TAKE SOME TIME YOU MAY WANT TO GRAB A CUP OF COFFEE." This remark brings to mind the image of an accountant tactfully asking a client to stop looking over his shoulder while doing a complicated piece of work.

Financier's manual is well written and well organized. It is illustrated throughout with menus and sample displays. The typeset text succeeds in presenting an excellent synthesis of instructions for operating the program, as well as explanations of accounting theory and procedures. Of all the products reviewed here, this manual is the most successful at presenting both types of information. There is also an extensive tutorial, thoroughly referenced in the manual, that requires an hour or two to complete. It guides you through the basic operations of the program.

An appendix in the manual explains how to set up files in the Financier Personal Series to keep records for taxes. If you follow these instructions, your finan-

cial data will be compatible with other Financier Tax Series software. This companion software package includes a matrix that follows the 1040 long form. It will help you figure out which of your account categories fits into various parts of the tax form. The program permits "what if . . ." manipulation of data, sets up calculations for depreciation and lump sum distribution situations, and has graphing capabilities. Annual program updates that adjust for changes in federal tax laws will be available.

***CHECK WRITING
features may not save
you much time and
effort if you only
write a few checks at
home each month.***

Selecting a Program

All five of these programs are designed for personal finance management, but each one has a different emphasis. Your choice of one program over another will be guided to a large extent by what you want in an accounting system.

If you want to maintain a budget and keep records for only one checking account, Money Moestro will provide an easy-to-use system that is adequate for this modest purpose. A more complicated set of accounts can be supported by Home Accountants Plus; this is the only program of the five that provides extensive graphs and charts to display your records visually. The Bonus Accounting System is the only one that maintains a true double-entry accounting system. FMS II is the least expensive program in this group. It provides maximum flexibility in setting up programs in different ways. However, its structure and the manual's instructions provide little to help inexperienced users set up an accounting system.

Out of all these programs, the Financier Personal Series provides the best balance of extensive capabilities and ease of use. The manual is outstanding as an introduction to both the practice of bookkeeping and the use of a personal computer to perform this task. /PC

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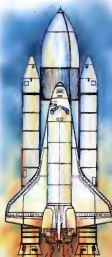
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Accounting software ranges from useless to excellent. Some programs don't follow the rules of the profession. Others can increase efficiency dramatically.

Eight General Ledgers For Small Businesses

There are several compelling reasons for a business to keep complete and accurate records of its financial transactions—not the least of which is the IRS. Businesses are required by state and federal law to report income and expenses, but even without that requirement, most companies would find it practically impossible to carry out their day to day activities without good financial records. Indeed, sloppy accounting procedures have been

the downfall of more than one otherwise healthy enterprise.

The range of financial transactions that even a small company needs to monitor can be mind-boggling: net worth, cash-on-hand, receivables, receivable aging (how long has the company been owed a payment), payables, budgeting, payroll, payroll deductions, estimated taxes—the list goes on and on. Until fairly recently, about the only way a small company could record these transactions was manually. And as anybody who has been



balance a checkbook can tell you, such annual record keeping is tedious and time-consuming.

It's no surprise, then, to see small businesses embracing the power of personal computers as a way out of the paperwork angle. Even a one-man business will probably generate enough paperwork to make automated record keeping a highly worthwhile endeavor that will pay back handsome dividends in both time and accuracy.

Up to \$1 Billion

Most bookkeeping programs for personal computers can handle up to 999,999 on any one transaction, and a billion on any total. While other considerations (such as a relatively high number of separate transactions) might cause certain businesses to use minis or mainframes, many large companies could benefit to use small computers. The mar-

ket for bookkeeping software for personal computers ranges from one-man operations at one end of the scale, to multimillion dollar operations at the other.

Since so many potential customers fit this description, there is likely to be a huge market looking for this kind of software, and a small horde of individuals and companies is writing financial packages for the IBM PC.

A number of those companies should have pondered longer before snapping at the bait: writing an effective bookkeeping program requires not only a thorough knowledge of computers, but a professional level of accounting expertise. Most financial packages reviewed here seem to have been written by people more familiar with computers than with accounting. The results, in many cases, are packages that lack the polish and professionalism expected from programs selling for as much as \$1,000. For example, some programs let the user perform actions that are forbidden by established accounting practices, such as allowing the deletion of a posted transaction. Others omit critical functions, such as a password system to prevent unauthorized access to records. And still others display such annoying habits as using convoluted accounting terms in unconventional ways.

Doomed to the Junkpile?

Depending on the intended use of the

program, these oversights can be either mere annoyances or fatal faults that doom the package to the junkpile. Individuals using one of these programs for their one-man businesses might not be bothered by the lack of password protection; for a company with hundreds of employees, password protection would be essential. Professional accountants will be confused by the imaginative redefinition of terms; nonprofessionals have enough to learn about accounting to use these programs effectively, without being misled by incorrect terminology.

To make matters worse virtually all the programs are difficult to use. The major gripe here is not so much a lack of helpful menus or clear explanations (although generally, the documentation is not very good), but a lack of any kind of logical sequence. For example, only one of the programs lets the user set up all the account information at a single point in the installation process.

And experienced accountants—probably the one group of people that should find the programs the easiest to use—will have to relearn old ways of doing things. None of the programs knows, for example, that a credit is subtracted, and must therefore be preceded by a minus sign. The user is forced to manually input the minus sign for each credit. Yet when an accountant enters a credit in a manual bookkeeping operation, he need not pre-

ceda it with a minus sign. These programs are not aimed at the professional, nor are they geared to the novice, who will probably need professional assistance to use the programs correctly.

That, to some degree, may be the nature of the beast: accounting is a profession that cannot be learned overnight. A bookkeeping program will not turn a novice into an instant pro. With varying degrees of effort—not to mention frustration—the programs are all useable and can accomplish what they claim.

In fact, one of these programs does exactly what it promises, has a very logical method of operation, and is easy to use. It shows the kind of professionalism and refinement a buyer plunking down hundreds of dollars needs and expects to find in a program of this sort.

Giving Users Control

All of the programs reviewed here bill themselves as general ledgers. A general ledger is the complete record of all of a business's transactions; it is the heart of any bookkeeping operation. To be effective, a general ledger needs to correspond closely to the type of business for which it is used. There is a variety of features and functions that must be considered to guarantee this compatibility. For example, if a company needs to track the hours billed by an employee to a given client, the bookkeeper using a manual operation would simply label that account "billed receivables." The situation is not so simple with a bookkeeping program: if a program has a fixed and predefined format for its reports, the bookkeeper might find himself looking at a column labeled "value of cost of goods sold," when it should really read "hours billed." Such a company should probably not buy a program that uses a fixed and predefined format for its report generation. Most, but by no means all, of the programs reviewed here allow the user at least some control over the format.

Even if a company plans initially to computerize only its payroll or inventory, it should look ahead to when it will want to integrate all of its accounting functions in one general ledger. To that end, some of these programs allow the addition of optional modules that support new functions as needed; others attempt to include all the functions in the main program.

Examine all the functions and features carefully to ensure that they will meet both present and future needs.

The reviews that follow evaluate several facets of each program: documentation, installation and set-up, operation, features and limitations of the package, reports, security features, and various accounting considerations unique to each program.

Documentation and Setup

The first thing a user should always examine when he buys the program is documentation. Each review takes a hard look at the program manual. In addition to a clear explanation of how to set up the accounts and use the program, the manual should fully explain how to handle all necessary computer-specific items. All but one of the programs required that the user first copy DOS onto the program disks. Unfortunately, many of the manuals erroneously assumed the user already knew his way around DOS.

Next, the manuals should include a thorough description of the day-to-day operation of the program. Manuals with well-written tutorials and numerous examples of operating procedures are almost a necessity when using programs of this complexity.

Although the information should be presented in a logical sequence, it also helps to have an index. When information is presented in tutorial form, an

A *bookkeeping program will not turn a novice into an instant pro.*

index for later reference is practically a necessity. A glossary is also valuable, particularly when the manuals redefine established terms.

Getting a general ledger program up and running is a two-part process. The first involves operations familiar to experienced users: copying the required PC-DOS operating system files to the program disk, for example. With some pack-

ages, the greater challenge is to figure out what needs to be done and how to do it; with others, complex procedures are carried out with little user intervention.

The second process will be more familiar to an accountant: setting up the chart of accounts, adding beginning balances, budget amounts, and comparative amounts (amounts from prior periods). This part of the job is made much easier when the documentation includes samples and step-by-step tutorials.

The two-part nature of the process—one part familiar to a programmer, the other to an accountant—illustrates the need not to assume too much prior user knowledge. Individual users are unlikely to be both programmers and accountants.

Features and Limitations

The reviews next consider how the programs behave in day-to-day operation, any features that ease the daily routine, and the limitations of each program. The reviews further describe such daily tasks as getting into and out of the system, entering and correcting data, and periodically copying the data to a backup disk. Programs should be reliable and not crash or dump the user into the operating system when they encounter unanticipated input. And they should warn the user when the data disk is reaching capacity, explain what to do when this happens, and suggest backing up the data at regular intervals.

The reviews take special note of exceptionally good or bad aspects of each program. For example, the BPI program includes a queue feature that allows the user to make a list of operations to be carried out automatically. This turns out to be a great time-saver, especially when printing reports or checks.

Reports

A printed report is the end product of all general ledger packages, and should precisely fit the needs of the business. Good financial statements can be exceptionally powerful management tools, often providing the answer to such questions as when to expend and when loans are needed. The value of a report can be significantly affected by its layout, so this section discusses the features and flexibility offered when preparing reports. A

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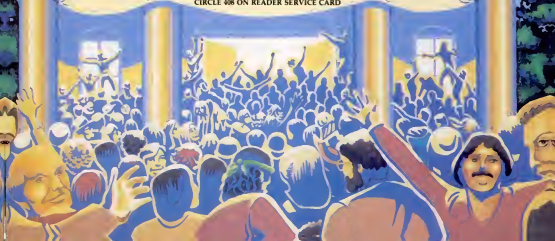
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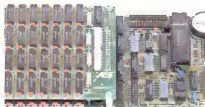
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report is most likely to meet the needs of a particular firm if the user can customize its format. Such flexibility does extract a penalty in extra set-up time and effort on the part of the accountant. In general, even the programs with flexible report formatting allowed only the major financial statements to be customized; other reports, such as trial balance and journal entries, are fixed in format.

A highly desirable and frequently overlooked feature is the ability to print reports on a letter-quality printer that will accept letterheads. Many of these programs support printers with tractor feed only. Showing a report that has ragged edges and funny-looking dot characters to your banker is probably not the best way to impress him.

PC users interested in general ledger programs should ask other important questions. Does the program allow the generation of reports that include budget comparisons with prior accounting periods? Can separate reports for each department be printed? Are the reports that are fixed in format easy to read? Do they use correct terminology, and include appropriate detail? (Too much detail on a report is distracting; this was a problem with some of the packages.)

Ideally, programs should allow the user to prepare customized reports, and the customization job should be quick and painless. To that end, several of the programs with flexible report formatting included a default format. Since any single format is unlikely to correspond exactly to what a company needs, provisions should be made to alter the default formats easily.

Although one of the outstanding virtues of using a computer to generate a report is that the material can be previewed on the screen before printing, many of these programs lack the capability to preview a report. This is a major irritant that can lead to time consuming reprinting of reports.

Security and Accounting

Security encompasses three distinct elements: audit trails, data security, and system access. Audit trail is the accounting process that backtracks the path taken by data through the accounting system. It is a tool for verifying computed entries.

Many of the typical audit trails used in these programs can uncover most potential problems.

Audit trails can be expedited in a number of ways. For example, every entry to the accounting system can be assigned a transaction number. The program should not allow the user to change transactions that have been posted; errors should be corrected by using additional transactions that compensate for the mistake. Nor should the program allow the chart of accounts set up at installation time to be modified (except to allow new accounts to be added and unused accounts to be deleted). This means the program should not let an account that has been brought to a zero balance be

*D*AY-TO- day data entry is slow.

deleted, since this would make it difficult if not impossible to run a successful audit trail.

Data security is concerned with the loss or alteration of data due to operator errors or system malfunctions. Although machines such as the IBM PC have proven to be extremely hardy and reliable, no such claim can be made for most of the accounting software on the market. To put it bluntly, many accounting programs are simply not reliable. Some programs, for example, go completely haywire when the printer is left off or the wrong disk is inserted. This is practically inexcusable in a professional program of this type. There are few operator errors that a program cannot anticipate and protect against. Leaving off the printer or inserting the wrong disk is not one of them. The best way to avoid the thicket of problems that awaits the careless—i.e. human—operator is frequent back-up of important programs and disks; there are many ways of accomplishing this. The better accounting packages explain these procedures fully.

The last aspect of data security is system access. To minimize the risk of unauthorized modification of programs or records, system access should be con-

trolled, preferably through some kind of password hierarchy. Some systems only check the password when the system is first turned on; others can be used to limit access to each operation. In any case, it's a good idea to lock up disks when they're not in use.

Accounting Considerations

Finally, each review in this survey covers such accounting considerations as the handling of unbalanced transaction entries and the use of batch totals for input verification. In a double entry system, the two sides of each transaction should be entered at the same time; the system can check that the corresponding transactions on each side of the book are equal and of opposite sign. The ideal system continuously displays cumulative totals for both sides of a transaction, and warns of any imminent out-of-balance situation.

An accounting system should look for and reject erroneous account numbers; batch totaling is one way of verifying the correct entry of account numbers and amounts. Batch totaling is the comparison of computer-generated sum of the entries against a corresponding sum the operator has calculated on an adding machine.

A good accounting system is a complex matter, and picking the right accounting package requires careful deliberation. By using the reviews to determine how closely a program comes to the ideal one described above, it should be possible for the prospective buyer to pick a program that fully suits his or her needs and wants.

General Ledger 2.0
Computer Systems Design, (CSD) Inc.
1105 W. Lincoln
P.O. Box 735
Yakima, WA 98907
(509) 575-0320
List Price: \$485

The General Ledger 2.0 operator's manual contains most of the information needed to make full use of the program. The information is presented in a logical sequence, with most of the basic procedures described in three lessons. The first lesson covers day-to-day operations; the second sets up the chart of accounts and report formats; and the third explains

special situations such as year-end closings. This is an excellent method of organization; users need only concern themselves with one task at a time.

The pages in the manual are difficult to read. They are printed in small, single-spaced type, and the subject headings tend to fade into a wall of text. The use of boldface type and more white space would have helped increase legibility. A helpful table of contents is included, but the lack of an index prevents effective access to information buried within the lessons.

PC-DOS Expertise a Must

The first action required by all but one of the accounting packages involves adding the PC's operating system to the program disk. With General Ledger 2.0 procedure is easy to find, but the operator must have a good working knowledge of PC-DOS. For example, the manual states: "Create a minimum IBM PC DOS system diskette that contains the following programs: ..." It contains no mention of just how to do this, however.

The actual set-up of the accounting system is relatively difficult. No provision is made when establishing the chart of accounts to input beginning balances, so these must be entered later as a standard transaction called an "opening entry." Retreat to the main menu is difficult when setting up new accounts or posting opening entries. (At one point in each transaction, a message appears that explains how to exit; when exiting, there is a forced printing of all newly entered data before the main menu finally appears.)

Report formatting must be set up along with the chart of accounts—not a very logical sequence of operations. Since no default formats are included, even as examples in the lessons, the user will probably require professional assistance in generating the right formats.

Forced Printing Slows Operation

Day-to-day data entry is slow. Because the program forces the printing of reports after a group of transactions, there are constant irritating waits for the printer to finish. This irritation may be minor compared to the one that could occur if the operator lets the disk fill to capacity, something that would be fairly easy to do, since the program gives no warning whatsoever that a disk is nearly full. To its

credit, the need for frequent backups is explained well, and the required procedures are described in a clear step-by-step sequence. General Ledger 2.0 provides a reminder to do the backups during every exit sequence.

This program presents a screen layout for transaction entry that is clear and uncluttered. (Num Lock must be toggled off, or the screen will become garbled.) The program uses and prints only uppercase letters. Do not try to use the backspace key since it alters the layout of the data entry screen; use the left arrow instead. The program cannot be used to reconcile checking accounts. Two nice features are the automatic placement of decimal points and the automatic saving

then starts over again with transaction number one. This does not accomplish the same audit trail purpose, and slows down the entire entry process, since printing is forced each time a group of transactions is posted to the master file. Changes to entries are allowed only prior to marginally entered data into the master file on the data disk; after that, reversing entries must be used. Modifications to the chart of accounts are properly limited to adding new accounts and changing accounts that have never been used.

One way to track system outputs is by data- and time-stamping every print run, and then listing all prints runs made within a specified period. Also, year-to-date historical general ledger data can be accumulated along with monthly data to provide an additional check. General Ledger 2.0 includes neither of these features.

The program is not immune to system crashes. While nobody likes to have a program crash and prematurely, this program crashes at least sporadically on the disks. It does not include any type of password security system, checks for out-of-balance situations, or any kind of batch totaling.

The overall balance sheet for this program shows a few pluses for good tutorial, flexible reports, and pleasing layout. Unfortunately, these were offset by major negatives. Chief among these were the annoying slowness of operation, poor system security, poor handling of out-of-balance situations, and crashes. This is a fairly expensive package for a program with so many problems.

BPI General Accounting System
BPI Systems, Inc.
3423 Guadalupe Road
Austin, TX 78705
(512) 454-2801
List Price: \$425

As implied by the package title, BPI's General Accounting can be expanded from a stand-alone general ledger into a multi-purpose system capable of handling most of the accounting functions required in a small to medium-sized business. The package grows in capability through the addition of optional special function modules; modules are available for accounts receivable, accounts pay-

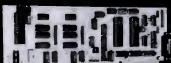
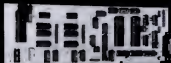
THE BPI manual is a genuine pleasure to use.

of new data to the program disk, where it is held for later merging with the master file on the data disk. Transaction dates can be carried forward, saving some keystrokes.

Flexible report formatting means that General Ledger 2.0 can be used with most all types of small businesses. None of its reports can be displayed on the CRT screen; the only way to look at a report is to print it. Those printed reports come out in uppercase only, noncompressed mode, on 8½ × 11-inch paper. Flexible formatting is used on the financial statements and schedules; other reports use a fixed format that turns out documents that are clear and easy to read. Departmental reporting—for up to 99 different departments—is supported, but reports comparing current amounts to prior period amounts or to budgeted amounts are not available at all.

Wandering Audit Trails

A standard audit trail procedure assigns a number to every transaction entered, and retains the numbers for future use. General Ledger's variation of this assigns numbers only until the printing of the transaction list takes place. It



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Electronic Accountants

A summary of the features of eight general ledger programs examined in the accompanying article.

	GENERAL LEDGER 2.0	BPI GENERAL ACCOUNTING	DATASMITH BOOKKEEPING SYSTEM	GENERAL LEDGER SYSTEM	GENERAL LEDGER	GENERAL LEDGER BY PEACHTREE (IBM)	PEACHTREE SERIES 4	VERSALEDGER II
	Computer Systems Design, Inc. 1125 W. Lincoln Yakima, WA 98907 (509) 575-0220	BPI Systems, Inc. 1423 Louisiana Rd Austin, TX 78705 (512) 454-2801	Datasmith P.O. Box 6036 Shawnee Mission, KS 66206 (913) 381-9516	Software Laboratories, Inc. 9124 Riverside Dr Dublin, OH 43017 (614) 859-5083	CYMA Corporation 2160 East Brown Rd Mesa, AZ 85203 (602) 825-8860	IBM Corporation P.O. Box 1128-L Boca Raton, FL 33432 (305) 990-2000	Peachtree Software, Inc. 3445 Peachtree Rd Atlanta, GA 30326 (404) 262-2376	H & E Computronics Inc. 50 N. Foxrock Rd Spring Valley, NY 10977 (844) 425-1535
MODULES INCLUDED	General ledger	General ledger Accounts receivable Accounts payable Payroll	General ledger Check printing	General ledger	General ledger	General ledger	General ledger	General ledger Check printing
ADDITIONAL MODULES AVAILABLE	Accounts receivable Accounts payable Payroll Job cost Cash flow	Accounts receivable Accounts payable Inventory Job cost	Payroll Date Manager	Accounts receivable Accounts payable Payroll	Accounts receivable Accounts payable Payroll Inventory	Accounts receivable Accounts payable Payroll Inventory	Accounts receivable Accounts payable Inventory	Accounts receivable Accounts payable Payroll
PRICE	\$485.00	\$425.00	\$300.00	\$100.00	\$1,000.00	\$400.00	\$600.00	\$150.00
MAXIMUM NUMBER OF ACCOUNTS	400	1,000 total accounts and transactions	2,500 total accounts and transactions	400	Approximately 1,600	100-500	800	999
MAXIMUM NUMBER OF TRANSACTIONS	1,200	1,000 total accounts and transactions	2,500 total accounts and transactions	2,500 total		Approximately 1,700	1,700-970	900 minus the number of accounts
MAXIMUM NUMBER OF DEPARTMENTS	99	10	1	99	Any	100 (10 reported)	99	8
LARGEST ENTRY AMOUNT		\$1 billion		\$10 million	\$10 million	\$10 million	\$10 million	\$10 million
LARGEST TOTAL AMOUNT					\$ 4 billion		\$21 million	\$ 1 billion
PASSWORD SECURITY?	No	No	No	No	Each activity	Enter	No	Maybe
OUT OF BALANCE TRANSACTIONS	No indication	Can't be posted	Can't be posted	Can't be posted	Totals displayed	Can't be posted	Totals displayed	Can be posted
REPORTING MEDIA FLEXIBLE FORMAT?	Hardcopy only Yes	Screen/hardcopy No	Screen/hardcopy No	Screen/hardcopy Yes	Screen/hardcopy Yes	Hardcopy only Balance Sheet only	Screen/hardcopy Yes	Screen/hardcopy Yes
BUDGETING?	No	No	No	Yes	Yes	Yes	No	No
COMPARATIVE STATEMENTS?	No	No	Yes	Yes	Yes	Yes	Yes	No
TYPES OF BUSINESS	Most	No services	No services	Most	Most	No services	Most	Most
EXTRA REPORTS?	No	No	No	No	Yes, and bar graphs	No	Schedules possible	No
QUEST?	No	Yes	No	No	No	No	No	No
BACKUP	DOS on disk	DOS on disk	DOS on disk	Built-in	DOS not on disk	DOS not on disk	Built-in	DOS not on disk
DOCUMENTATION	8.5 x 11 looseleaf 34 pages	5.5 x 8.5 looseleaf 200 pages	8.5 x 11 looseleaf 45 pages	8.5 x 11 spiral 42 pages	8.5 x 11 bound 225 pages	5.5 x 8.5 looseleaf 250 pages	8.5 x 11 looseleaf 125 pages	8.5 x 11 spiral 125 pages
TUTORIAL	Good; includes set-up	Good, but no set-up	Sample data only	Minimal	Good; includes set-up	Minimal	Minimal	Minimal
MEDIA	2D	4D	2D	1D	1D	3D	3D	2D
SYSTEM SPECIFICATIONS	64K RAM 2 disk drives IBM PC DOS 80-column printer	64K RAM 2 disk drives IBM PC DOS 80-column printer	64K RAM 2 disk drives IBM PC DOS 132-column printer	64K RAM 2 disk drives IBM PC DOS Either 80- or 132-column printer	64K RAM 2 disk drives IBM PC DOS 80-column printer	64K RAM 2 disk drives IBM PC DOS 132-column printer	64K RAM 2 disk drives IBM PC DOS 132-column printer	48K RAM 2 disk drives IBM PC DOS 132-column printer

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OR AREAS

NO

PLAIN ENGLISH PROMPTS

NO

INDIVIDUAL COLUMN
WIDTHS

NO

EXTENSIVE FORMATTING
CAPABILITIES

NO

PROTECTED CELLS

NO

MULTIPLE, LINKED
WORKSHEETS

NO

SORTING CAPABILITY

NO

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The following worksheet contains a grid of up to 40 columns and 40 rows. The grid is divided into four quadrants. The top-left quadrant is labeled "Region 1 Data". The top-right quadrant is labeled "Region 2 Data". The bottom-left quadrant is labeled "Region 3 Data". The bottom-right quadrant is labeled "Region 4 Data".

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WORKSHEET

YES

ON-LINE REFERENCE GUIDE

YES

"NAMING" OF CELLS
OR AREAS

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

PLAIN ENGLISH PROMPTS

YES

INDIVIDUAL COLUMN
WIDTHS

YES

EXTENSIVE FORMATTING
CAPABILITIES

YES

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

Region 1 Data Worksheet				
	A	B	C	D
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400
Region 1 Data	100	200	300	400

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ables, inventory, and job costs.

The BPI manual is a genuine pleasure to use. The content, organization, and legibility are excellent. Different type sizes and shading are used to emphasize various subjects; no wall of words intimidates the new user. The manual also includes edge tabs, a nice feature that, when combined with the fine index and excellent glossary, turns it into an effective reference document. Even better, the manual is sized to sit on the keyboard ridge without blocking the screen. Programming and computer jargon are avoided, and accounting terms are all used correctly.

A tutorial is interspersed throughout the fourth chapter; it would be easier to follow if the entire tutorial were kept in one section. Applications included in the tutorial include cash receipts/sales, cash disbursements, accounts receivable/sales, accounts payable and check printing, purchases, payroll, and journal operations. The section on data entry includes sample data that can be entered as part of the lesson. A manual this good goes a long way toward cutting a difficult job down to size.

Although set up is a fairly elaborate and time-consuming operation, the manual includes complete, detailed instructions, right down to a few words on making the proper labels for new disks.

One of the most pleasant parts of BPI's General Accounting package is the ease with which data can be entered and edited. Errors caught before saving the data to disk are easily corrected. After saving, a separate editing program is available for making corrections. Screen layout is also well designed. The screens are clear and contain all the information the operator needs to know. All data must be entered in uppercase, but unlike many other programs, the backspace key is fully functional. The computer emits a beep when it expects data to be entered, and two beeps when it receives an unacceptable entry. The result is a symphony of beeping.

Although there are no "disk almost filled" warnings, the program does offer access through the main menu to a "check diskette space" function; using it is far easier than pulling out the DOS disk. Also, this is the only package that discusses what to do when a disk fills up before the end of the accounting period.

Its suggestion to go through an early closing is not a particularly appealing solution however, since this means performing the closing process twice. It also makes such processes as performing an audit trail more complex. All in all, it's a quick-and-dirty answer that yields sloppy results.

ALL REPORTS *are clear, with the proper amount of detail and correct use of accounting terms.*

Thank Queue Very Much

BPI's General Accounting is an all-inclusive package. General ledger, accounts receivable, accounts payable and payroll are rolled into one program. The system offers automatic incrementing of checks, invoices, and accounts receivable statements. It also allows out-of-sequence numbers to be issued when necessary.

Three particularly attractive features of BPI's package are keyboard buffering, automatic recurring entries, and automatic decimal placement. Most users of word processors take keyboard buffering for granted. With buffering, if the operator is typing faster than the computer can print to the screen, no characters are lost. When the operator slows down, the computer catches up printing the letters to the screen. The recurring entry feature allows actions that must be input at regular intervals—depreciation or amortization, for example—to be entered automatically by the computer.

While these attributes might be considered minor niceties, one feature is a real asset: a queue that provides for automating many operations. The user simply lists the functions that are to be run; and the computer then feeds these functions to the user automatically, one after the other. The queue is particularly useful when printing reports. A list of reports to be printed is sent to the queue, freeing users of the onerous job of killing time while one report is printed before they can enter another print request.

BPI's General Accounting is one of the

two packages that can print checks. Further, it is the only system reviewed here that lets the user print all checks at a single time, rather than issuing a check as each entry is input. The drawback is that it can handle only one checking account at a time. This trait is particularly annoying in view of the fact that the package purports to implement an elaborate scheme capable of manipulating multiple checking accounts. It can, but its methods of doing so fly in the face of established accounting procedures.

General Accounting's payroll function can issue payroll checks and accumulate payroll data for tax reporting. Unfortunately, the system does not contain any payroll tables, so the user must calculate all payroll deductions manually. And a thorough examination of the manual failed to turn up even a mention of W-2 forms.

Fixed Reports Only

Because all report formats are fixed, the income statement produced by the program is suitable only for companies that have inventories. A service-oriented company would have incorrectly labeled columns, which makes for a very puzzling income statement. The reports themselves are printed using only uppercase characters, which detracts from their presentation. All the reports are clear, with the proper amount of detail and correct use of accounting terms.

Losing the Trail

Audit trails in this program could be improved significantly. For example, entries can be edited at any time, a practice not allowed under accepted accounting practices. And a general ledger account with a zero balance can be deleted, even if it had activity during the period, which is also forbidden. Individual transactions are not numbered and the package lacks password protection. Equally troubling, users can change the invoice numbering or cash disbursement numbering system at will. On the positive side of the ledger, the system is very good at handling operator errors; and no crashes interrupted the system's operation.

General Accounting uses a true batch system in which the operator runs an adding machine tape prior to the data entry. Upon completion of a batch, the operator

can verify the adding machine totals against the computer totals. The package will properly reject out-of-balance situations and nonexistent account numbers.

The overall balance sheet for this program is mixed. It has several good features, and one really excellent feature, the queue. It also has a few very significant omissions, particularly the lack of a security schema. These flaws prohibit a strong recommendation. However, the program is useable by those companies to whom its fixed reports are appropriate.

Datasmith Bookkeeping System
Datasmith
P.O. Box 8036
Shawnee Mission, KS 66208
(913) 381-9118
List Price: \$300

The 45-page manual supplied with Bookkeeping System is both informative and well-organized. The pages are attractively formatted, with good use of white space and boldface type. Its presentation, which follows the program's menu sequencing, includes a table of contents, an index, and several sample reports. Some advanced features of the program require a good working knowledge of file handling and PC DOS just to understand the manual's explanations, however. Instructions for setting up the working disks are vague, with an annoying tendency to refer the reader to the IBM DOS for specifics.

Instead of a tutorial, Datasmith has included a disk that contains a sample set of books for instructions and experimentation. A glaring omission is the lack of any guidance in using the disk.

A Nasty Little Habit

Daily date entry, expedited by good use of the PC function keys and the dual intensity feature of the monitor, is easy and smooth with Bookkeeping System. The date and description are offered as possible default entries when appropriate, making entry a little bit easier. Editing entries is also a fairly easy task.

This program has a rather wicked habit of crashing when issued a print command with the printer turned off. This dumps the operator back into BASIC. Although the manual is no help here, this

type of crash isn't fatal. Typing **Cont** to the BASIC prompt gets the program running again.

Backup is described only in relation to end-of-period posting, and not with respect to daily data entry. A handy batch file is included that allows easy backup of individual files. This program makes better use of the PC's keyboard than most of the general ledger packages, accepting

**A MAJOR
annoyance of this
package is the number
of frequent and long
delays between
operations.**

lowercase responses to queries, for example.

Limited by Reports

When it comes to the reports, it's strictly uppercase noncompressed characters in a fixed format. The program is limited by its report generation capability. Reports are appropriate only for very small retail/wholesale operations, or for a small manufacturer.

When printing reports, the balance sheet and the profit and loss statement fit into 80 columns, but statements showing comparative (prior) period amounts require 132 columns. Since the program doesn't support the condensed character mode that can fit 132 small characters onto an 80-column page, the user is faced with the choice of buying a 14-inch printer or learning how to send control character sequences to the printer. In general, the fixed format reports are good—with the exception of some inappropriate double underlining of characters, and terminology that is occasionally confusing.

Hiding Your Tracks

Bookkeeping System offers no built-in audit trails. Any entry, account number or account balance can be changed or deleted without hindrance and without a sign that it was done. (What a boon to shady operators!) Transaction numbers are generated, but they provide no audit

trail benefit because they are adjusted whenever a transaction is deleted. Again, no sign remains of the deletion. The system doesn't offer any type of password protection.

Datasmith has implemented a check to confirm that each transaction balances. Out-of-balance entries generate a warning message and a listing of entries slated for correction or deletion. The system will not post an unbalanced transaction to the journal. The program makes no use of batch totaling to check data entry.

The bottom line for this program shows several definite pluses—a good manual and a nice screen layout—overshadowed by several major flaws, including poor system security, poor audit trails, and frequent crashes. This particular litany of problems appears so often it probably should be given a name. In any case, these problems prevent this program from earning a positive recommendation.

General Ledger System
Software Laboratories, Inc.
6924 Riversdale Drive
Dublin, OH 43017
(614) 889-5083
List Price: \$100

General Ledger System's 42-page manual looks better than it performs. The page layouts are easy to follow, with good headings, large type, and lots of white space. But the pages don't say much. The tutorial is short, consisting of just two transactions to be entered, some report printing, and an end of period closing. It fails completely to cover such critical information as how accounts should be set up. It also uses unnecessary and confusing computer jargon.

Setting up the disks at installation is very easy. The single command, **Setup**, automatically performs many steps that other packages expect the user to do manually. The program has provisions for user-specified automatically recurring entries, and also offers a few default report formats.

Easy to Use

Software Labs has made General Ledger System very easy to use in day-to-day operations. Default entries are offered for the account number, description, reference, source, and date. The input screen

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Glossary Of Accounting Terms

These standard definitions should aid nonprofessionals in evaluating the accounting software packages reviewed in this issue.

Account—A record that accumulates transactions of a particular type.

Audit Trail—A procedure that allows an entry to be traced through the system.

Balanced—A situation in which the different sides of a transaction are equal.

Balance Forward—The balance in an account that is transferred to a new ledger.

Bank Reconciliation—A verification of a checking account balance.

Batch Total—A total calculated for a group of entries made at a single time. To perform a batch total, the operator manually sums the entries to be made to the computer; this manual total should equal

the sum generated by the computer for the same group of entries. Batch totals can be run on practically any group of numbers, such as check amounts or account numbers.

Budget—Estimated amounts of future expenditures.

Chart of Accounts—A listing of general ledger accounts, set up in numerical order, and divided into four categories: assets, liabilities and capital, income, and expenses.

Closing—The process of getting all current period records ready to be entered into the general ledger in a summarized format, followed by the process of entering these records.

Comparative Statement—A financial statement that shows amounts by category

for two time periods, both of which start and end on the same date, but in different years.

Cumulative Total—An amount that includes all transactions up to the present. A year-to-date total is an example of a cumulative total.

Departmental Reports—Reports that show summaries of transactions allocated to a given department.

Double Entry—The standard accounting method used today, which derives its name from the fact that every financial transaction involves two different accounts. In a double entry system, the exact amount that is added to an account (added to one side of the books) must be deducted from another account. For

layout is good, and the function keys are used for easy menu selection. Like many of the other accounting packages, General Ledger System does not accept lowercase inputs. Considering this, the program logically enough powers up with Num Lock and Caps Lock on. Exiting the program and submenus was simple and consistent—just strike the Esc key. It does take a long time, though.

Backup is almost painless. Exiting the main menu puts the user into PC-DOS, ready to run a Diskcopy program. And clever instructions make the end-of-period closing procedure a cut above average. While other programs warn the user to copy the data disk for archival storage before using it for new period data, General Ledger System asks for a blank disk for the new period, leaving the current data disk untouched for archival storage. This procedure means there is no worry about forgetting to save a copy of the old disk before overwriting it.

A major annoyance of this package is the number of frequent and long delays between operations. Data entry seems to run at a snail's pace. Correcting errors during input is easy. Once entered, items could be changed only by reversing entries. This is the correct procedure according to standard accounting practices. A feature sure to be appreciated is

THE PROGRAM
handles out-of-
balance situations
quite well.

the ability to call up any particular account to the screen without having to run a trial balance report. The program cannot do bank reconciliations.

Flexible Financial Reports

General Ledger System has flexible formatting for financial statements, suitable for use in virtually any type of business. Setting up its formats, however, might require professional assistance. While only the two standard financial reports are flexible in format, the flexible format reports are clean and very readable. Financial statement schedules are not explicitly offered, but could probably be generated by using departmental account numbers for certain categories of expenses. There is one confusion in terminology. The report called the trial balance is really the general ledger; there is no report specifically called a general ledger.

All reports are 132-columns wide, but since the program supports condensed mode printing on the PC's printer, the reports can be attractively printed on 8½-inch-wide paper with no cutting or pasting.

ample, a rent payment would be deducted from a checking account and added to the Rent Expense account. Double-entry accounting provides instant verification of the amounts entered onto the books; both accounts should always show the same amounts, but of opposite sign.

End of Period—The end of a time period that was defined as an accounting cycle.

General Journal—A record of transactions not recorded in specialized journals.

General Ledger—A summarized record of all of a business' transactions; monthly totals of cash receipts and cash disbursements are two examples of records that could be found in the general ledger.

Financial Statements—Reports that show summaries of transactions. The balance sheet and the income statement are two examples of financial statements.

Flexible Format Reports—A report whose layout and headings cannot be customized by the user.

Flexible Format Reports—A report whose layout and headings can be customized by the user.

Journal—A record of transactions.

Ledger—A record that contains a list of accounts, and the entries and balance of the accounts.

Opening Balance—The balance in an account that is transferred to a new ledger; also called balance forward.

Opening Entry—The journal entry that records the balance forward.

Out-of-balance—A situation in which the two different sides of a transaction are not equal. (See also Double Entry.)

Posting—The transfer of totals from a given accounting period to the general ledger. According to established accounting practice, after posting, no new entries can be made in the journal for that accounting period.

Posting Reference—The physical piece of paper that documents a transaction.

Prior Period—An earlier accounting interval against which current figures are often compared.

Recurring Journal Entry—Also called a standard journal entry, this is an adjustment to the accounting records, which is the same amount at the end of each period. Appreciation or amortization could be recurring journal entries.

Reversing Entry—An entry used to nullify a previous transaction. Once made, a journal entry should not be changed. A new entry of equal magnitude and opposite sign must be made to compensate for any incorrectly made entry.

Schedule—A listing of account titles.

Transaction—An event such as the issuance of a check that causes an entry to be made in the accounting records.

Trial Balance—A verification of the account balances in the general ledger.

Year-to-date—The period of time from the beginning of the year to the current date. /PC

Security

As with many of these programs, security is a weak point with General Ledger System. There is no reference to system security in the manual. The initialization routine implies that a password system can be set up, but it does not say how, and never asks for a password. Contrary to standard accounting practices, accounts with a zero balance and zero year-to-date amounts can be deleted, and batch totals and account numbers are not generated.

The program handles out of balance situations quite well. After a set of transactions is entered, the cumulative totals of both sides of the transactions are displayed. If both entries balance, the amounts are posted; otherwise, no posting takes place.

This program crashes frequently. Once the program is written in interpreted BASIC, recovery is usually possible by typing Run or Cont, although the manual fails to say so. The fact that the

program is interpreted BASIC probably also accounts for its slow speed. Running it through the BASIC compiler would probably clear up that problem.

Overall, this program earns a mixed review. The disks are easy to set up, the reports are good, and moving from feature-to-feature is simple. However, frequent crashes, too much computer jargon, and a terminal case of the slow shuffle limit General Ledger System's effectiveness. However, users looking for an inexpensive program will find this one to be a lot better than many of the higher-priced spreads.

CYMA General Ledger, Version 1.01
CYMA Corporation
2160 East Brown Road
Mesa, AZ 85203
(602) 835-8880
List Price: \$1,000

Despite manuals of almost encyclopedic size—two bound volumes totaling 225 pages—the documentation for CYMA's General Ledger is the weakest link in an otherwise strong chain. This is not to say that its manuals are bad; it's just that the rest of the package is much better. Part of the problem with the manuals can be attributed to the fact that they were written for a variety of computer hardware, rather than solely for the PC. CYMA is currently revising the manuals and expects to have new ones ready shortly. The size of the manuals is probably unavoidable. This is a powerful program with many features and functions, and describing them all adequately is bound to gobble up a lot of space.

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Accounts receivable-officer	980.63
Deposits on future purchases	171,447.86
Inventory-raw materials	2,523.00
Inventory-finished goods	16,522.00
Prepaid expense	402.65

TOTAL CURRENT ASSETS	482,675.76
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PROPERTY AND EQUIPMENT:

Furniture and fixtures	6,932.92
Automotive equipment	24,840.38
Capital containers	8,542.00

Accumulated depreciation	15,627.00	40,315.30
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15,627.00

24,688.30

DEFERRED TAX BENEFIT	1,425.00
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1,425.00

ORGANIZATION COSTS, net	1,806.27
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1,806.27

OTHER ASSETS:

Sales tax bond	925.00
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925.00

4511,520.33

Figure 1: A sample financial statement balance sheet generated by Cyma Corporation's General Ledger System.

ines such advanced features as job costing and multi-company system setups. The second volume is a procedures manual, the reference that operators would use in day-to-day operations.

Each page of the manuals has an identical layout consisting of the operation's title, a picture of the CRT screen, and some comments on carrying out the operation. Unfortunately, the comments are not sufficient. The pages are very legible. The headings stand out, the type is large, and generous use of white space makes the format easy on the eyes. The manuals

have indexes and glossaries, but do not have edge tabs.

Instructions for setting up the working disks are not mentioned in the manuals. A separate one-page installation sheet is supplied specifically for the IBM PC, but it is more confusing than helpful. This problem should be corrected when the manuals are revised.

Setting up the CYMA General Ledger takes a long time, which is probably unavoidable considering the flexibility of the program. Instructions for setup fill almost the entire applications manual.

Other than report formatting, a job that will probably require professional assistance no matter whose package you buy, system setup is quite easy. One minor complaint: the package does not allow for recurring monthly journal entries.

Going with the Flow

Data entry is fast and smooth with CYMA. Screen layouts are clear and consistent, and the program allows both uppercase and lowercase letters for all entries. Editing during entry is easy; after entry, however, editing requires exiting to

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a different menu and is more difficult. The system offers defaults for many entries, a feature that users should appreciate. There are no disk-filling warnings or other reminders to back up the data disk, and the program cannot do bank reconciliations. Entering and exiting the different operations is fast compared to most of the other packages we surveyed.

Super Flexible Reporting

Thanks to the very flexible formatting of reports, all types of businesses can use this program. Up to 14 different report formats can be stored, allowing several custom reports in addition to the standard ones. The user can design financial statements (see Figure 1), schedules, departmental statements—whatever is needed. Budget and comparative statements are included as separate menu selections. There's also a bar graph function that will print a graph of any account's balances according to date—very impressive. All reports are generated from general ledger data.

One problem when designing the flexible reports is that the manuals don't describe the capacity of a format. There are only 21 lines available for each format. If the report is long, it has to be spread out over two different formats, which is difficult. Formats can't be changed; a new one has to be entered from scratch. CYMA has indicated it intends to include some type of format editing in future releases of the program.

Fixed format reports in the system include journal listings, the general ledger, and the working trial balance. These layouts are all clear and easy to read.

Reports are printed in 80-column mode with noncompressed characters. Buy lots of paper if you purchase this package: every financial statement report is followed by a page-feed command, with the result that much is wasted.

Doing it Right

It is possible to design an accounting system with proper password protection; CYMA has done it with this package. The program actually implements two distinct systems: a password to separate different companies' books, and a security code within each set of books. A different code can be assigned to any or all of 14 different operations within a company's

set of books.

The program numbers each transaction as it is entered into the system, but does not use them to best advantage. At every end-of-period closing, the transaction number is reset to one. A better audit trail would have been provided if this number were reset at the end of a fiscal year only. And, instead of making available a list of each transaction and its associated number, the program provides only a list of deleted transactions.

Posting references can be whatever the user desires. Data, description, document and posting reference columns are provided, so the nature of an entry is easily identified. Batch totals are generated for all data entries from a given session, but no batch total is run on the account numbers themselves.

INFORMATION
*is easy to locate when
using the manual as a
reference.*

While this program could be improved, its very few problems are minor, and most of these might be fixed in the forthcoming manual revision. The program is hard to learn, but once mastered, is easy to use in day-to-day operations. This is a powerful program appropriate for most types of businesses. It earns our wholehearted recommendation.

General Ledger by Peachtree Software,
Incorporated
International Business Machines
P.O. Box 1328-C
Boca Raton, FL 33432
(305) 998-2000
List Price: \$600

The first accounting package offered by IBM was Peachtree's General Ledger, announced at the time of the PC's introduction in October 1981. (It is also known as Peachtree Series 8.) Both in its packaging, which looks like other IBM software, and in its operation, it is nothing like the newer Series 4 package available directly

from Peachtree.

The manual displays one endearing characteristic common to most of IBM's PC application packages: it is comprehensible to the novice. It begins with very clear and detailed instructions on getting started. The first chapter covers such subjects as supplies, choosing options, and learning how to proceed. The next chapter is devoted to gathering data, and will be immensely helpful to the first-time user. Other chapters present excellent instructions on performing backups and setting up accounts. Sample and blank input sheets are included to aid the operator in setup and data entry.

The layout of Peachtree's manual is especially appealing, with different colors of ink separating the computer's responses from the author's comments. The order of presentation is logical, following the order of data input. Consequently information is easy to locate when using the manual as a reference.

Neophytes are likely to run into some trouble when they start the actual setup procedure because of errors in word spacing concerning the Copy commands. Since this program was first released for the IBM PC over a year ago, the problem should have been corrected by now.

The package includes a tutorial on entering a sample set of data. Unfortunately, it is of limited value, as its explanations are limited to setting up an account, adding, posting a pair of transactions, and printing a set of reports. For such difficult procedures as setting up balance sheet formatting, there are instructions but no tutorials. And, tutorials have an annoying tendency to refer to a different chapter for directions.

Screen layouts are clear and easy to read. Most items can be entered by specifying the value from the previous transaction when appropriate. Recurring monthly journal entries are entered automatically. Editing is simple. Function keys tell the computer what fields need changing. Exiting an operation is also simple—just strike the Esc key. All data entry end most commands may be entered in either uppercase or lowercase characters. For some reasons, this handy feature wasn't carried over to requests for depreciation and amortization schedules, which require uppercase entry. Overall, however, it all adds up to a program that

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lets data entry go very quickly.

This package requires that the printer be turned on before the program will run. No printer, no accounting program.

Not for Service Companies

Since the income statement uses a fixed format containing a cost-of-goods section, only those businesses with inventories—small to medium-sized wholesaler, retail, or manufacturing concerns—would find the income statements appropriate. With the exception of the balance sheet, all other reports are also of fixed format. The fixed formats are not crowded with excess data and are very easy to read. They are printed with compressed characters that allow 132 columns on 8½-inch-wide paper. The compressed letters look very good, although they seem to take longer to print. Reports can be printed but there is no way to view them on the screen.

Keeping It Under Control

Peachtree's General Ledger offers a two-level password system. One password bearer (called the controller) may select an option that forbids the deletion or alteration of any previous entry. The controller may also select an option that forces a printout of a control report. Control reports list all transactions entered during a data input session. The other password is used to limit general access to authorized operators only.

Both the general ledger and journals include the standard posting references: data, original document referral, source document code, and any other means of identification the user chooses. An especially nice feature is report time- and date-stamping; this allows the user to find the most recent report quickly.

The printer must be left on during operation; if it is turned off during data entry, the program will crash. This is a pretty silly reason for crashing. Recovery is fairly simple, however.

The system rejects one-sided entries and incorrect account numbers with a beep and a staunch refusal to post the wrong data. Batch totals displayed on the input screen also help ensure accurate data entry.

This is another program with quite a few pluses and relatively few minuses. For some applications, the omission of a

flexible income statement will be a major problem. Though not as powerful as the CYMA package, at \$600 it's considerably cheaper. This program is recommended for businesses whose needs correspond to Peachtree's fixed income statement.

General Ledger System Series 4

Peachtree Software, Inc.

3445 Peachtree Road

Atlanta, GA 30326

(404) 239-3000

List Price: \$600

Last summer Peachtree expanded its line of accounting packages for the IBM PC with the introduction of the Peachtree Series 4. Unlike the older Series 8, which the company now markets exclusively through IBM as a package called General Ledger, Peachtree distributes the Series 4 itself.

The 125-page manual is well organized, but hard to use. It does not include an index to locate specific items, and the screens are not self-explanatory. As a result, the manual has to be read and reread to ferret out pertinent items imbedded in the text.

Although it contains all the necessary information, it keeps referring to "your computer representative" for help with installation and operation. Most buyers will probably purchase this package from

***THE SYSTEM
rejects one-sided
entries and incorrect
account numbers with
a beep and a staunch
refusal to post the
wrong data.***

a retail computer store. Many stores are not willing or able to provide such support.

The layout of the manual leaves a lot to be desired. Subject headings are underlined, but spacing is too tight for easy

reading. One section includes diagrams that are printed sideways on the page, which makes reading them annoying and awkward. The book also makes frequent and unnecessary use of computer terms (fields and master files, for example) to explain important operations. This renders the descriptions much harder for nonprogrammers to understand.

As if all that weren't bad enough, the manual contains an error guaranteed to drive a new user up the wall. The operator is told to add three files to each program disk, per the instructions in the computer's operations manual. (Peachtree's manual no doubt was referring to the IBM DOS manual, but why subject the user to flipping back and forth between two different manuals?) In any case, this is not the error. The manual instructs users to copy the following three files: COM-MAND.COM, BASIC.COM, and the CP/M operating system! This little gem is undoubtedly going to cause much frustration and lots of phone calls. The manual meant to say copy PC-DOS, of course. (The easiest way to copy PC-DOS to a fresh disk is to execute the Format command with the /S option. Then all that's needed to do is copy BASIC.COM.) Special instructions for setting up data disks are hidden in Appendix G.

The tutorial runs briefly through an accounting period cycle. It consists of entering two transactions, printing reports, and closing the period. A sample set of report formats is included. Automatic recurring monthly entries may be installed during system set-up.

Data may be entered in lowercase, although command entry is limited to uppercase. Defaults are offered for the description, posting reference, source, and date. There are no disk-filling warnings.

One item the manual neglects to mention is backup, possibly because it is performed automatically at each end-of-period closing.

The financial reports have flexible formats that can be tailored to all types of businesses. The sample data includes examples of formatted reports, although the tutorial fails to step through a sample formatting operation. Budget, comparative, or departmental reports may be set up.

Fixed format reports have an attractive layout; they don't cram so much data into

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a single page that it becomes hard to read. There are some significant errors in terminology, however, such as calling the general ledger a "trial balance."

Breaking and Entering

System security is virtually nonexistent in this program. Nor does it offer accumulation of detailed year-to-date historical general ledger data, or time end

THE TUTORIAL is of little help in setting up the books.

date stamping of print runs. Original opening balances may be altered with no telltale signs left behind. Audit trails will be difficult to follow with this program. Crashes are numerous, sometimes as a result of accidentally hitting one wrong key. However, the program can be restarted by typing Run.

During transaction entry, the screen displays the transaction number, the accumulated amounts for each side of the transaction, and the difference (the out-of-balance amount, which should be zero). This is the proper information, but the program stops there. If told to go ahead and post an out-of-balance transaction, it will do so.

Overall, this program has several good features, in particular its end-of-period backup procedure. It also has a raft of problems, such as opening balances that can be changed at any time. It suffers from the common affliction, "pospatfreer"—poor system security, poor audit trails, and frequent crashes. As before, these problems prevent us from giving this program a good recommendation.

Versoledger II
H & E Computronics
50 N. Pescack Road
Spring Valley, NY 10977
List Price: \$150

The user's manual for Versoledger II is quite good, especially for users who want to understand the program in great depth,

and are willing to put in lots of time studying it. Those users just trying to set up and run the program will find it difficult. Despite, or because of, the voluminous quantity of material presented in the 125-page manual, information is hard to locate. The process is made even more difficult by tiny type, tight spacing used throughout the manual, and the lack of an index. Much of the terminology is confusing, partly because the manual was written for TRS-80 systems, and partly because the check register section of the program is incorrectly treated as a general ledger. Programming terminology is sprinkled liberally throughout, and the manual assumes a great deal of expertise with file handling.

Although no disk set up instructions were included in the manual, this was the only program reviewed that came with a disk ready to run.

The tutorial is minimal, consisting mainly of printing out reports based on sample data. It does not touch on financial statements or end-of-period posting, and is of little help in setting up the books.

Inconsistent Operation

Versoledger's screen layout is difficult to follow. While uppercase letters are required for command entries, lowercase may be used elsewhere. Exiting commands are also inconsistent throughout the system. In one section, a "-1 -1" command would exit; in another, "End" is required; and yet another required a "@"." There are no automatic recurring journal entries or automatic decimal placements. On the plus side, all of the screens offer defaults when an input was called for, speeding entry and making it less monotonous. Disk-filling warnings, or prompts to back up the disk, are lacking entirely. The user must reboot the PC-DOS disk to perform disk checking and backup.

Versoledger has a bank reconciliation feature that is quite nice. The program can also sort the check register transaction file or the general ledger transaction file by any of five fields. A check writing feature automatically increments check numbers as checks are written. Users can also enter out of sequence numbers as desired.

Reports

Versoledger has flexible financial

statement report formats appropriate to all types of businesses. Defaults are available to assist the user when setting up the flexible reports.

All other reports are of fixed format. On the whole, they are easy to read, with just about the right amount of detail. The terminology is confusing, however. For example, the report titled "Detailed Year-to-Date Trial Balance" is really the general ledger.

Most reports may supposedly be printed on either 8½- or 14-inch wide paper. However, when the print parameters were set to 80 columns, the printer would print 132 columns on the second line of every report. It takes several minutes for the income statement to print, probably because of a delay in sorting.

Weak Security

Versoledger does not include a password system. Contrary to good accounting practice, the program offers no obstacle to changes or deletions of any account

ACHECK
writing feature
automatically
increments check
numbers as checks are
written.

or transaction. There are no built-in indications of out-of-balance situations, and the program will allow a one-sided entry to be posted, thus throwing the whole ledger out of balance. The system does not offer any batch-total figures. Transactions are numbered automatically, however, and the general ledger has posting reference audit trails.

The balance sheet for Versoledger shows several minor pluses, more than offset by an overwhelming number of both major and minor problems: figures that can be changed at any time, no out-of-balance rejection, no system security, a manual written for a different machine, and so on. We don't recommend this program.

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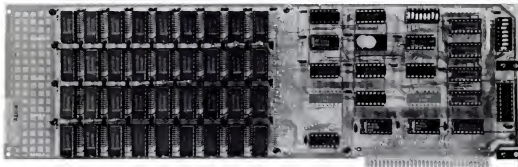
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The PDI464 features six separate functions—expansion memory, two asynchronous serial channels, a real-time clock, a disk emulator, and a print spooler. Together with its high quality, the PDI464 offers a price-performance ratio that is tough to beat.

The memory section of the PDI464 provides up to 256KB of fully socketed expansion memory with parity generation and checking. Four memory sizes are available from 64K up to 256KB to meet a variety of needs. Regardless of memory size ordered, each PDI464 is tested with a full compliment of 256KB of memory to ensure trouble-free future expansion. Disk-based memory diagnostics are included which can test memory integrity and report problems down to the chip level.

Two asynchronous serial channels are provided which are completely compatible with IBM serial channels. Each channel can be selected to reside at one of four addresses to allow for future expansion. A unique feature is provided which allows simple selection of data terminal or data communication equipment (DTE/DCE) configurations, thus eliminating the need for special cables or null modems. Each channel has its own connector mounted on the back bracket and comes complete with two 6 foot RS-232 cables.

The Real-Time Clock section features quartz-crystal control and lithium battery back-up to ensure years of trouble-free

operation. The RTC features hours, minutes, seconds, day-of-the-week, date, month, and year with automatic leap year adjustment. Software is provided to initialize system time and date information automatically upon power-up.

p-Disk™, a disk-emulation package provided with the PDI464 allows memory to be treated as an ultra-fast disk drive. p-Disk™ can be configured as a single or double-sided drive and can appear as drive B, C, or D. p-Disk™ does not require modification or patching of the BIOS or DOS files on system diskettes and is fully compatible with IBM software and diagnostics.

A background printer spooler is included with the PDI464 which allows files to be printed on a printer while other software is being used in the foreground. The spooler offers features such as menu-selectable configuration, multiple copies, and automatic file deletion.

Comprehensive documentation is provided with numerous illustrations to simplify installation procedures. All documentation fits neatly into existing 3-ring binders provided with the Personal Computer.

Each PDI464 is "burnt-in" at elevated temperatures and fully tested. Packaging material provides protection from static and mechanical shock during shipment to further ensure reliability. The PDI464 is covered by a one year limited warranty.

p-Disk™ is a trademark of Pure Data Ltd.

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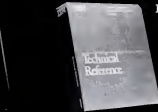
Disk Drive Cover

Designed to protect the disk drive area from dirt and dust, this is made from black plastic that was produced to match the IBM's contemporary styling. The vinyl foam seal around its perimeter prevents harmful elements from entering the disk drive area.

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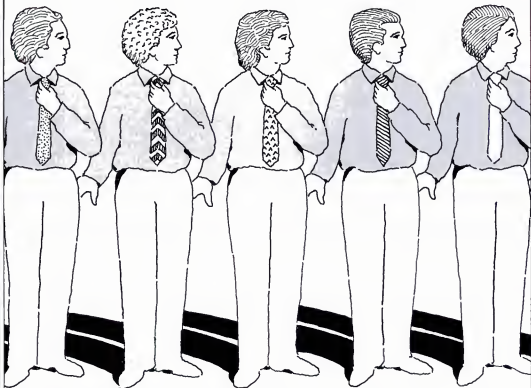
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Trade secrets have become the biggest commodity in Silicon Land. Your point of view depends on whether you've got something worth protecting—or revealing.

Trading Secrets



Protecting trade secrets is an area of the law that you must take into your own hands: your lawyer can't enforce your trade secret protection system for you.

What exactly is a trade secret? According to James Pooley in his book, *Trade Secrets*, it is valuable proprietary information, especially "any data that helps sell your product or increase your revenues or profits. A chemical formula, a

manufacturing process, a customer list; or an analysis of your competition suggest just a few examples."

Pooley does a good job of defining what trade secrets are, how they can be protected, and how to minimize the chance of being sued by the alleged owner of a trade secret. While the book is not directed exclusively at the computer industry, much of the information it con-

tains could be very useful to a software or hardware company.

A Hypothetical Case

Johnson and Atkins work for Boardware, a production company that designs and produces add-on boards for computers like the IBM PC. Johnson is the vice president of sales and Atkins works in development. The two employees are best

friends. They belong to the same racquet club, and whenever Johnson is not on the road, they lunch together. It has been their mutual dream to one day own their own production facility.

Lately, morale has hit a low point. Atkins increasingly resents her overbearing boss, who usually manages to take the credit for her designs and innovations. And Johnson is upset because he feels he should be entitled to more stock than the employee stock plan currently provides. The two employees find that their lunches are deteriorating into complaint

SPARKS MAY FLY and smoke billow as companies fight it out in the courts.

sessions. After quite a bit of soul searching, planning, and research, the pair decide to strike out on their own. With

Johnson's Original Equipment Manufacturer (OEM) sales contacts and Atkins' production abilities, they figure they can set up a company that will out-sell and out-produce Boardware—within 12 months.

Trade Secrets and Startups

So far, this parable has more or less mirrored the reality of the computer industry. Companies form, grow, and in turn, employees quit to form their own companies. Often the young venture companies are not in direct competition with their parents. But when they are, watch out! Sparks may fly and smoke billow as companies fight it out in the courts. And what are they fighting about? Trade secrets.

Suppose Johnson and Atkins proceed to start up their new company and Boardware objects. What if, in fact, Boardware does more than object; it sues? What grounds does Boardware have to sue its former employees? And why shouldn't Johnson and Atkins be allowed to earn their living any way they see fit? Boardware's ability to stop former employees



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from engaging in direct competition depends on how well Boardware has protected its trade secrets.

First, to protect itself, Boardware

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Pollution and Health
American Health Conference

5.1 Air Pollution

Natural processes such as forest fires and volcanic eruptions, or burning cities and after during war, have long contaminated the air. Long and the by-products of coal burning have long been recognized as irritating substances. These many areas and climates the air.

Air and water pollution are obviously all people on the earth share the ocean and the air. Significant local pollution of either can grow to affect distant areas, especially if the ocean current is the process of precipitation, radiation, and absorption through the atmosphere. Effects include lowered communication, inevitably, depression, fatigue, and tension.

5.1.1 Types of Air Contaminants

There are three major types of air contaminants:

- Combustants** Additional liberation of carbon monoxide, sulfur oxides, and nitrogen oxides into the air.
- Dust** A mixture of matter of fine and coarse.
- Facilities** Smoke particles such as dust, dirt, smoke, and fly ash. These are well known. Power, distribute light rays, infrared, and other things.

5.1.2 Water Pollution

Pollution of water from the natural processes of aquatic animal and plant.

* These processes are essentially due to these effects, as well as due to the

G. F. Bruff
June, 1982

life combined with human-made waste constitutes another hazard to health.

5.1.3 Types of Water Pollution

Traditional waste such as sewage supply needed by aquatic plant and animal life. When bacteria in the water can not decompose the waste, widespread aquatic death results.

5.1.4 Inorganic These pollutants enter the water carrying these bacteria either a river or stream. These microbes may spread infectious organisms or types of fungi, especially in rural and urban fringe areas where population density is high and public utilities limited.

5.1.5 Nutrients These elements that sustain plant life, particularly phosphorus and nitrogen, are produced by sewage, industrial wastes, and soil erosion. They are not removed by treatment centers and may inadvertently be changed into a more soluble mineral form that stimulates excessive plant growth.

5.1.6 Synthetic Chemicals Inorganic and pesticides affect water. There may be a possibility of human poisoning over time. Absorption generally follows this formula:

$$A_p = \frac{C_p^2}{C_p^2 + K_1}$$

where A_p , C_p and K_1 are as defined in Section 3.

5.1.7 Organisms Microbes from air-

These bacteria modifications discussed earlier. To say even, the effects combined with water pollution are disastrous.

** See Section 5.

Section 5
Page 37
Section 13

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should make a list of the information that it considers to be proprietary trade secret information. It should establish a set of procedures to add to the list as new information develops. The list serves a couple of purposes. First, it clearly identifies to employees what a trade secret is and what it is not. Second, and equally important, it would be useful in convincing a court that the information is indeed a trade secret that belongs to Boardware, and not simply generally available information.

Boardware's list might consist of its customers, schematics, source code to

APPEARANCES often determine who wins or loses a trade secret contest.

ROM-based programs, circuit board diagrams of unreleased products, and a list of suppliers. Pooley counsels, "Appear-

ances often determine who wins or loses a trade secret contest. Therefore, in qualifying a protectable trade secret, considering how it looks is as important as considering what it is." Therefore, Boardware should stamp "Confidential" on its customer lists and each page of its source code should contain a line that reads, "Boardware Confidential Material—Do not copy."

Next, Boardware should see to it that all employees sign nondisclosure agreements (NDA). These agreements obligate the employee to hold as confidential any trade secret information belonging to Boardware. They also provide that the



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BOARDWARE'S trade secret program might initially seem to be institutionalized paranoia.

information may not be used except for Boardware's benefit. Pooley supplies sample NDA forms at the back of the book. These can be modified to fit most situations.

Boardware also should make sure that its OEM customers sign NDAs and that vendors and visitors also sign. This helps create a mood in the company that the items contained on the trade secret list are to be closely guarded at any cost. Throughout the book Pooley continually stresses how important appearances are. "You must make the judge or jury believe you value your trade secrets as though they were the crown jewels."

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Monitoring Trade Secrets

You might think Boardware had done enough at this point. Not so. Developing a solid protection program also requires constant monitoring of trade secrets. Visitors and photocopies must be controlled. Shredders should be used and the building secured. Boardware should go so far as to follow Pooley's advice to "Consider requiring vendors to ship raw materials or chemicals in plain, coded containers, with no indication of contents or suppliers." The company should interview employees both upon hiring and fir-

ing to impress upon them the value the company places on its trade secrets. Education sessions are periodically held to reinforce these interviews. All this might seem sufficient, but the work is not done yet.

Pooley further suggests that companies set up a system for tracking confidential documents and for disposing or reclassifying documents. He recommends that employees be kept motivated and well paid so that they will be less likely to leave.

Boardware's trade secret program

might initially seem to be institutionalized paranoia. But it isn't. If you want to protect your trade secrets you must, like Boardware, do two things. First, you must do your best to physically prevent the disclosure of trade secrets. Second you must appear to have done your best to have pre-



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For more information, see Trade Secrets by James Pooley (Osborne/McGraw-Hill 1982) 145 pages; \$11.95 paperback, ISBN 0-931988-93-4.

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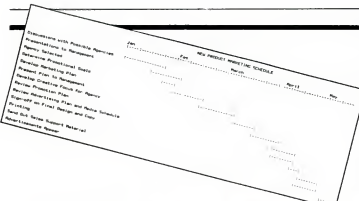
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Sideways is what Sideways does—an ingenious little utility that turns your Epson or IBM printer 90 degrees to the right. To be a little more precise, Sideways is a program for the IBM PC that prints virtually any copy across the length of a piece of paper instead of across

its width.

The manufacturer bills Sideways as "The cure for the spreadsheet taping blues," which is actually only one of its potential uses. With Sideways, you can also generate long, horizontal graphs and charts, and create stylized program listings.

Sideways requires PC-DOS, a disk drive, and an Epson MX or IBM dot matrix printer equipped with the Grafrax option. Versions to support some of the other popular printers including the Okidata and IDS machines are expected in coming months, according to the



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company.

Epson or IBM printers without the Graftrax chips can be upgraded to add the dot-addressable graphics option with a kit available at most computer dealers. Sideways will run with all the versions of Graftrax, including Graftrax 80 and Graftrax Type 2 with some minor alterations explained in the program's manual.

Sideways works by converting the image of a block of copy into a page of graphics. The Epson is then told to print the "picture" sideways.

Ease of Use

Sideways' 12-page instruction manual is attractively typeset and designed and generally very well organized. It gives instructions for transferring the Disk Operating System (PC-DOS) to the system disk.

Working from the A> DOS prompt, you type **SIDEWAYS** and immediately enter the program. The program displays its one and only menu, which offers 12 choices; you can go through each option every time if you choose, or you can set up a table to fulfill your routine needs and only have to make changes in unusual cases.

Thinking Sideways

The first of the 12 choices allows you to direct output to any of three parallel printer ports: LPT1, LPT2, or LPT3. The program reads the automatic settings of your PC; it will not allow you to send copy to LPT3 if you have only two printer ports installed.

Vertical form size is the length of the paper in your printer, normally set to 11 inches. If you are using a roll of paper without perforations or if you want the printer to continue past perforations without issuing a form feed, the vertical form size may be changed.

Horizontal form size is the width of the paper in use—the distance between perforations if you are using tractor feed paper. The program allows you to toggle between the 8-inch width of the MX-80 and IBM printers and the 13.6-inch maximum width of the MX-100 model.

Selecting a Style

You may set the style of the printout through selections among character font size, double strike option, character spacing, or line spacing. There are two choices

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of character font in Sideways: normal and large. The normal setting is not quite the same as the factory-equipped Epson font. The large font is not as large or bold as the double-width setting on the printer, but in each case the character design is attractive and possibly even an improvement on the Epson's original.

Sideways' type style is slightly more

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rounded than the Epson's regular character set, making for more graceful letter. The design of the symbols and numbers on Sideways is much more forceful than Epson's design. Periods and commas are firmly stamped and zeros are chiseled with six-pointed precision. Most machines give users the option of ordinary weight or double-strike printing. If you have a Graftrax Type 2 MX-100 machine, you are limited to single-strike printing.

The next available choices involve character and line spacing. Think sideways: Character spacing is the distance between columns of characters, measured in terms of the vertical dot density of the printer. Using the normal font with character spacing set at 1 yields 12 characters per inch. The large font set at 1 produces 8.

Line spacing is the distance between successive print lines, measured in terms of the horizontal dot density of the printer.

You may set a different character and line spacing assignment for each character font. Changing fonts on the display menu automatically calls up the default values you have set.

Choose Your Format

The left margin (Think sideways!) is the setting for the distance between the top of form and the leftmost character to be printed. Top margin sets the distance between the edge of the paper and first printed line of copy.

Printing length controls the number

lines printed down (across?) the sideways page. If you leave the setting at 0, the program automatically computes the number of lines that print on the page. The formula, if you prefer to set the number manually, says that the number of lines plus the top margin cannot be greater than the horizontal form size. The default limit is set at 53 lines per page for an 8-inch form.

And now, the sideways heart of the program: the maximum printing width. You may set this at any number that seems applicable—the default setting is 1,200 characters per line! Compare that to the ordinary limits of 80 or 132 characters or an MX-80.

Leaving the maximum printing width setting at 0 directs the program to compute the maximum number of columns it can handle based on the available RAM of your PC. The program won't use up any more paper than is needed by the longest line to be printed.

Striking the F1 function key saves the current settings to disk in a file called SIDEWAYS.DFT, which is consulted by the program at each startup.

Printing a File Sideways

You might have the Sideways file added to the program disk of your word processor or spreadsheet program, or you may enter it from a separate disk. The Sideways menu automatically positions the cursor at the line that asks for the name of the file to be printed. The file

is listed on the menu.

Sideways also follows the global filename conventions of DOS. For example, you could instruct the program to print all programs with the extension .DOC by typing B:*.DOC. The program would accommodate single-drive systems by pausing for the insertion of data disks when needed.

A Loss of Speed

The price you pay for going sideways is a significant loss in printing speed. The program pauses for a few moments while it reads data from the file into memory,

and then the printer is driven at a slower, deliberate speed. The head prints in only one direction (from bottom of the page to top), but the Epson does retain its short-line logic—the head retracts only as far as the first letter it must print in each line. It is hard to compare printing speeds with the direct output of a word processor, but I would estimate that Sideways' output is less than half that of the unfettered Epson MX-80. The printer also sounds very different in its operation, more as if it is drawing letters rather than printing them.

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you pay for going
sideways is a
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printing speed.

name is entered in ordinary DOS format: d:\filename.ext)_.

If you do not remember the names of the files available you may enter the name of the drive—drive b:, for example—and then strike the right arrow key on the cursor pad. This automatically steps you through the available files on the data disk. Merely hit Enter when the right file

Creating Files for Printing

Sideways works only from files that have been saved to disk—not those resident in the computer's memory. Therefore the user must understand how to save these files.

Sideways will also balk at any file that includes printer control codes such as boldface, underline, subscript, and superscript. It has trouble with word processors or other programs that use nonstandard formats for text files. The way around the problem is to divert the word processor's output to a disk—in other

words, to "print to disk."

The Sideways program was tested with four different word processors — WordStor, MultiMote, IBM's original EasyWriter, and Word Worker.

The only one that worked without modification was WordStor. Although WordStor printed dot commands in the copy, it would be easy enough to strip them from copy with a global search command. The MultiMote files were merged into one very wide paragraph, with / codes marking where paragraphs should have been. EasyWriter, which stores all of

its constituent files in a single FORTHSCREEN entry, was undecipherable without modification. Word Worker which stores files as ordinary ASCII characters, printed acceptably, although there were all sorts of numerical codes related to formatting style interspersed between paragraphs and pages.

SIDeways works by converting the image of a block of copy into a page of graphics.

Sideways' manual also warns that some spreadsheet programs automatically insert a carriage return and line feed into a print file whenever the number of character columns reaches some predetermined limit. The instructions advise setting this column limit as high as possible so as not to constrain Sideways style.

Unusual Copy-Protection

The one last filip of this unusual program involves its means of copy protection. The program includes a utility that allows the purchaser to create one backup copy of the program and transfer any copy of the program from one disk to another.

The provision for transferring copies sets Sideways apart from most programs. It copies the program to a new disk checks to see if the new copy is accurate and automatically deletes it from the original.

The copy utility is invoked by entering a /C after the program name, as in A>SIDeways/C. The program disk is warranted to be free of defects for 90 days from purchase. If you've got the need Sideways has the solution. It works well if a bit slowly, and with some understandable limitations on the sorts of files it can handle. All in all, however, Sideways is a clever sidetrip for your PC and printer.

/P

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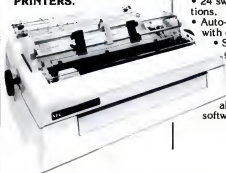


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Kaleidoscope

Kaleidoscope is a deceptively simple graphics demonstration program. It requires a color/graphics adapter. BASICA, and a single disk drive. The sharpest, most precise graphics will be produced on a color RGB monitor; an ordinary color television set hooked up to an RF modulator is sufficient to produce interesting and unpredictable effects.

Kaleidoscope uses the technique of drawing parallel or nearly parallel lines in close proximity. Kaleidoscope alternates colored lines with black background lines. Variation of the angles between lines produces changing geometric patterns on the screen.

The program loop beginning at line 800 is an example of how this effect is produced. The pair of LINE statements at 820 and 830 in the program listing draw a colored line and a background line at a diagonal angle that decreases as the loop variable X increases. Lines 840 and 850

KALEIDOSCOPE
alternates colored
lines with black
background lines.

also use the X loop variable to draw a pair of lines at the opposite angle from the other pair. The loop from lines 800 to 860 produces designs that cover half the screen. The remainder of the screen is covered in a similar fashion by the loop at lines 870-930 where changes in the Y variable affect the design. The process is repeated for patterns that cover halves (lines 950-1170) and quarters (lines 1180-1570) of the screen. Three outer loops starting at 760-790 control and vary the background color, the chosen palette, and the foreground color selected from those on that palette.

The PC Reveals Its True Colors

Run these demonstration programs to see all the colors available on your PC. Then, learn how to ask for colors by their names in assembly language and BASIC.

Color in Assembly Language

The IBM PC requires a color/graphics adapter to generate color displays. This board contains a Motorola 6845 CRT controller and 16K of RAM. The adapter operates in alphanumeric and graphics modes and can be controlled by instructions in assembly language or BASIC. The following discussion will show how each of these two languages can be used to control display color in two of the available modes: alphanumeric and medium-resolution graphics.

When assembly language is used to control graphics, the base address of the 16K display area on the adapter is 8000H. To avoid glitches, interrupt 2 occurs during vertical retrace.

In alphanumeric mode, characters are stored as 2-byte values: a display character byte followed by an attribute byte. Character bytes are stored at even addresses and attribute bytes at odd addresses.

The character byte contains a value corresponding to one of 256 available characters. Characters are formed in a 7x7 matrix within an 8x8 box.

The attribute byte describes the color attributes of the character. The format of the attribute byte is:

```
7 6 5 4 3 2 1 0
K R G B I R G B
```

Bits 3-0 (IRGB) apply to the foreground color: These four bits respectively determine whether intensity, red, green, or blue are activated for that character's color. Bits 6-4 (RGB) apply to the background color and represent red, green, and blue. Bit 7 (K) determines if the foreground color is blinking.

IBM has assigned the following values to the colors generated by the PC.

IRGB COLOR	IRGB COLOR
0 0 0 0 Black	1 0 0 0 Dark Gray
0 0 0 1 Blue	1 0 0 1 Light Blue
0 0 1 0 Green	1 0 1 0 Light Green
0 0 1 1 Cyan	1 0 1 1 Light Cyan
0 1 0 0 Red	1 1 0 0 Light Red
0 1 0 1 Magenta	1 1 0 1 Light Magenta
0 1 1 0 Brown	1 1 1 0 Yellow
0 1 1 1 Light Gray	1 1 1 1 White

The medium-resolution graphics mode stores color information in 2 bits for each pixel (picture element). Thus, each byte contains information for four pixels. Display memory is organized with even scan lines in the first 8000 bytes, followed by odd scan lines in the next 8000 bytes. The format for the pixels is as follows:

C1	C0	DEFINITION
0	0	Pixel is background color
0	1	Pixel is palette color 1
1	0	Pixel is palette color 2
1	1	Pixel is palette color 3

Background color is designated by an IRGB value and is controlled by bits 3-0 of I/O port 3D9H. Foreground colors are selected from the active color palette, which is determined by I/O port 3D9H bit 5. The three colors provided by each palette are defined below:

	PALETTE 0	PALETTE 1
Color 1	Green	Cyan
Color 2	Red	Magenta
Color 3	Brown	White

Color in BASIC

BASIC can also be used to control the colors on the display. The Screen statement sets the color/graphics adapter's mode of operation. It (with optional variables in brackets) is in this format:

SCREEN [mode] [, [burst] [, [apage] [, [vpage]]]

The mode variable (0, 1, or 2) determines the type of operation. If mode is 0, the display is set in alphanumeric mode; text is formatted in screen widths of 40 or 80 characters per line. Mode = 1 sets the medium-resolution graphics mode. Mode = 2 sets the adapter for high-resolution graphics mode; color displays are not available in this mode.

The burst number (0 or 1) switches the color capabilities on and off. In alphanumeric mode (mode = 0) a burst value of 0 disables color and a 1 enables color. In medium-resolution graphics mode (mode = 1) however, burst = 0 will enable color and burst = 1 will disable it. In high-resolution graphics mode burst will have no effect because this mode produces only monochrome displays.

Apogee and vpage can be used in alphanumeric mode. Apogee selects the text page to be written to and vpage selects the page to be displayed. Page numbers for both of these variables can be selected from the range 0 to 7 with a screen width of 40 characters, and from 0 to 3 for an 80-character width.

The alphanumeric mode displays characters from a set of 256 symbols formed by a 7x7 matrix within an 8x8 box (descending portions of some characters appear in the eighth row). The BASIC Color statement sets the color values that appear in alphanumeric displays. The Color statement is in this format:

COLOR [foreground] [, [background] [, [border]]

Foreground sets the color of the characters with a value from 0 to 31. Background sets the background color of the display; it can be a value from 0 to 7. Border sets the color of the display's border as a value from 0 to 15. The color characteristics that correspond to these number values are shown in this color value table:

VALUE	COLOR	VALUE	COLOR
0	Black	16	Blinking Black
1	Blue	17	Blinking Blue
2	Green	18	Blinking Green
3	Cyan	19	Blinking Cyan
4	Red	20	Blinking Red
5	Magenta	21	Blinking Magenta
6	Brown	22	Blinking Brown
7	White	23	Blinking White
8	Gray	24	Blinking Gray
9	Light Blue	25	Blinking Light Blue
10	Light Green	26	Blinking Light Green
11	Light Cyan	27	Blinking Light Cyan
12	Light Red	28	Blinking Light Red
13	Light Magenta	29	Blinking Light Magenta
14	Yellow	30	Blinking Yellow
15	High-Intensity White	31	Blinking High-Intensity White

Program Extensions

Kaleidoscope makes use of only one of the many drawing techniques available in BASIC that can produce interesting patterns and colors. Different displays may be produced by using other drawing algorithms. The only requirement for this visual effect is that the colored lines be drawn close to each other. In this program, color and background lines are made to cross by these lines:

```
820 LINE (X,0) - (319-X, 199) , C
830 LINE (X+1,0) - (318-X, 199) ,
```

Different results can be produced with a similar technique by drawing concentric circles that meet the following specifications: the radius of each outer circle is increased by 1 from the previous radius; any circle with an even numbered radius is colored, and all the odd radius circles are black. Circles of the same radius, but with their centers at adjacent display locations, would also provide an interesting visual effect.

The character used in lines 140-310 to form the PC logo is CHR\$(223); this symbol may be entered from the keyboard by pressing Alt while typing 223. If you use both a monochrome and color display with your PC, lines 100-110 will automatically select the color display. Lines 1620-1640 switch back to the monochrome display when you finish running KALEIDOSCOPE.

Running the Program

Enter BASICA, key in these lines of code, then save the program. To run the program at a later time, load BASICA and type the name used to save this program. Then sit back and enjoy the show. //

```
10 KALEIDOSCOPE by B. BAASD
70 DIM M(22): AS(15): DEFINT A-Z
80 SWITCHING TO COLOR DISPLAY
90 KEY OFF CLS: WIDTH=DEF SEG=0: A=PEEK(M4419)
100 FOR N=15 TO 1: A AND NOT(1) OR NOT(1)
110 WIDTH=40: SCREEN=1: SCREEN=.LOCATE ., ., 1, 0
120 WIDTH=40: KEY OFF
130 FOR N=1 TO 199
140 FOR X=0 TO 319
150 M(X)=0
160 M(X)=0
170 M(X)=0
180 M(X)=0
190 M(X)=0
200 M(X)=0
210 M(X)=0
220 M(X)=0
230 M(X)=0
240 M(X)=0
250 M(X)=0
260 M(X)=0
270 M(X)=0
280 M(X)=0
290 M(X)=0
300 M(X)=0
310 M(X)=0
320 M(X)=0
```




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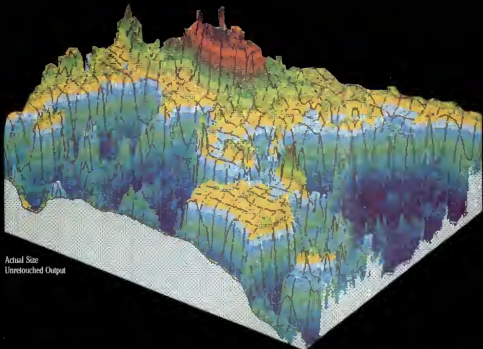
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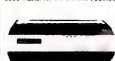
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If swallowing gumdrops, alien rockets, or three-martini lunches is your idea of a good time, at least one of these games will suit your taste.

The Organization Man Meets Pac-Man

Executive Suite

Armonk Corp.
610 Newport Center Dr., #955
Newport Beach, CA 92660
(714) 760-3955
List Price: \$39.95
Requires: 64K, one disk drive, monitor

Since you're reading this magazine, chances are you're (a) a cutting-edge button-downer who spends a lot of time negotiating the strange underground empire of corporate politics, or (b) a brilliant techie who prefers Smelltalk to smell talk and whose idea of dressing for success is a clean T-shirt. Either way, you'll probably enjoy Executive Suite. You type-A people can painlessly practice clewing your way into the board room, and you type-B's can experience all the thrills of the business world without having to punch a time clock or set foot inside Brooks Brothers.

Executive Suite comes packaged in a fake attaché case. This trend toward cuteness and even elaborate software containers—such as the dossier that InfoCom's *Deadline* comes in—may do more to discourage piracy than any encrypting. The only problem is that the name on the outside of the package is "Gray Flannel Fun"—the name of a division of the manufacturer, apparently. Armonk (a reference to IBM's headquarters in Armonk, N.Y. perhaps?) can't seem to decide what to call this game, and there's bound to be some consumer confusion. The package also includes a "Career Planning Aid" manual, but the instructions are pretty

superfluous. Just put the disk in your drive, turn on the machine, and follow the instructions on the screen, and you're in business—literally.

The first thing you see is a text-graphic picture of the Mighty Microcomputer

ing, or competitive drinking.

Climbing the Corporate Ladder

As it turns out, nothing you say on your application makes any difference in terms of your hiring or your career; it's just a nice gimmick to begin the game. The game really starts when you're presented with a choice of entry level positions. Meanwhile, the computer randomly generates information on whether the economy is poor, fair, good, or expanding. If you get the position you've applied for (you usually do), you see another text-graphic drawing of a hand pointing thumbs-up. You're then presented with a series of multiple choice questions about situations that come up on the job. Sometimes, there's only one "right" answer; in other cases, your judgment involves picking the lesser of various evils. For instance:

Jack Sterk, a Regional Sales Manager, proposes a little extra preparation for tonight's MMC Christmas Party.

He gives you two bottles of excellent vodka to slip into the punch bowl.

Do you:

- 1 - Do it
- 2 - Act shocked and decline
- 3 - Say yes, but keep the vodka for yourself

After you make your choice, the computer tells you the consequences of your decision. If, say, you've opted to spike the punch, you'll have earned good ole boy Stark's eternal friendship, but you'll have alienated a couple of your other colleagues who are allergic to alcohol. As in real life, your action might come back later.

***THIS TREND
toward cuteness and
even elaborate
software
containers—such as
the dossier that
InfoCom's *Deadline*
comes in—may do
more to discourage
piracy than any
encrypting.***

Corp. (MMC), the company where you are about to apply for a job. Angie the receptionist leads you into the personnel office where you're asked your name, home town, age, sex (male, female, or undecided; if you press "undecided," it makes you go back and decide), where you went to college, what you majored in, your work experience, marital status, and even some chit-chat about your favorite sport, whether sailing, armchair quarterback-



er to haunt you or to help you. There are over 50 characters in the MMC "family," all of them listed in an organizational chart in the accompanying manual, and some of them tend to have rather distinctive personalities. For example, there's Bucky Carter, ace salesman, who regularly appears to tempt you into unauthorized ski weekends and drinks with the boys.

Several multiple choices later, you'll come up for a job evaluation. Your performance will be rated, and your file will take note of your bad points ("poor interpersonal skills," "extravagant taste when MMC is paying the bill," "rubbing Bucky Carter the wrong way") and your good ones. The computer then randomly generates a new state of the economy and lets you apply for another job, usually at a slightly higher level than the one you've just had. Unlike real life, there seems to be no vertical career progression within one's field at MMC. You can go from being a sales trainee to an engineer to a personnel manager. The computer also randomly generates which of the good and bad points on your personnel record you're remembered for as you climb up the corporate ladder. If the economy is in bad shape and the computer recalls the time you slipped the vodka into the Christmas punch, you might have to step down and apply to the mail room.

Peaks and Perks

Every time you get a new job, a memo arrives in your electronic mail detailing your salary and your perks. As you move up toward the executive suite, you start raking in company Mercedes Benzes and other goodies. The game ends when you finally make it to the top of the heap, retire, or get fired, at which point the computer figures out your net worth.

Executive Suite doesn't use very many graphics, but those it does use are clever. When you get the ax, you receive a letter from the President of MMC detailing every stupid, dishonest, lazy thing you've ever done. The letter is followed by a moving graphics picture of a big arm waving you disdainfully away and the message: "HIT THE ROAD, JACK!" If you manage to fight your way to the board room, you're treated to a skyscraper-suite view of your domain and then whisked away to Europe on a text-graphics Concorde.

The PC function keys are used to advantage. F5 lets you take a "work break" and F6 lets you return to the game. F3 saves your current career in progress, while F4 lets you quit. A press of the F2 button will calculate your current worth. F1 is a general help key that reminds you of what all the other keys do.

The main problem with Executive Suite is that it tends to be repetitive. Despite the vast cast of characters and the dozens of jobs you can apply for, each with its own set of mini-dilemmas, it's hard not to go over ground you've been over in a previous game. I found myself inventing new wrinkles, like seeing how fast I could get myself canned, just to vary the pattern. As my assistant reviewer, 12-year-old Sedie, notes: "The best part is when you play it for the first time. The more you play, the more you can practi-



cally memorize what's going to happen next. But when you take a chance and apply for a job that you haven't done before, you lessen your chance of getting to the executive suite because you don't know what the right choices are that will get you anywhere."

My other assistant reviewer, 9-year-old Miranda, agreed that the game got "boring," but added, "One of the things I like about it is it makes you really feel like you're in the office and you're talking to the people." Miranda's point brings us to the question of values, and Gray Flannel's are fairly easy to gauge. You practically never go wrong if you consult somebody else in the company before making a move. There seems almost no way to join a labor union without dooming your

career. Business before pleasure, but don't be a stiff. Crime never pays. My feminist nose got out of joint when, after playing numerous games in my own identity, I "applied" as a male. Suddenly, I was suffering sexual harassment at the hands of the top female executive at MMC, vice president of administration Joyce Stern. Hey, c'mon, Armonk. In real life, it's usually the other way around.

The game might have been a little more commercial if MMC had been a sort of generalized Everycorporation instead of a computer manufacturer. Most of the multiple choices involve situations that could occur in any company. In fact, there's a fairly big percentage that seem to be focused on such universal fine points as sex, alcohol, nepotism, and what on earth you can possibly say when you unexpectedly get stopped in the hall by the President that doesn't sound terminally wimpy or overly brash. But some of the computer-specific scenarios may be a little arcane—and some of them aren't even especially accurate. A techie friend is still sputtering about being asked by the game what she'd do if she were a maintenance worker and water was leaking on some circuit boards. When she replied that she'd cover the boards first, the computer tossed off a snotty remark about ducks settling in on the cover and swimming merrily about. Apparently, the computer thought you should move the boards first.

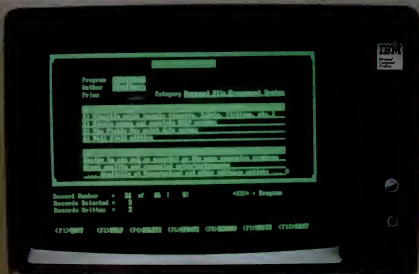
Executive Suite can't be copied. The manufacturer offers a 30-day warranty from date of purchase, which it will extend to 60 days if you send in a registration card.—LVG

Cosmic Crusader

Fantastic, Inc.
5-12 Wilde Ave.
Drexel Hill, PA 19026
List price: \$38.95
Requires: 64K RAM, one disk drive, color/graphics adapter, color or monochrome display; joysticks and game adapter are optional.

Yes, it's another shoot-em-up in outer space. But, if this sort of thing is your cup of antimatter clusters, then Cosmic Crusaders is an entertaining, thoughtfully designed and executed game.

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Minimum System requirements: IBM Personal Computer with BOTH color &
graphics capabilities - 256K Memory - One disk drive

MICROTAURE Inc.,
P.O. Box 6039, STATION "J"
OTTAWA (ONT.) K2A 1T1
(613) 344-0004



The game is a nicely souped-up version of Space Strike, which was an improved version of Space Invaders. The lineage is not that surprising, since author Michael Abresh wrote Space Strike (sold by another company, DataMost.) Abresh is also co-author, with Dan Illowsky, of Snock Attack II for the IBM.

The point of the exercise is to shoot down alien ships that pass back and forth overhead. A lot of care went into the design of the graphics and the play action; the ships don't just drop straight down, they sort of peel off in military formation. Sometimes the aliens fly alone; sometimes they use the buddy system. From time to time, a "refueling station" floats by, rotating in and out of view, changing color and shape as it passes. Knock down the station and you earn an extra shield. Get hit by a missile or ship and your station explodes in four directions.

The use of color and detail are very effective. Abresh has created a 3D effect with red and blue stars that shimmer across the screen. There is also an attractive

white outline around some of the red and blue ships. Calling for a protective shield feels the home base momentarily inside a white shell.

The sound is well done, too—just enough to quicken the pulse but not

to the color/graphics board as well.

Using joysticks, the handle moves the ship left and right, while the top button activates shields and the bottom button fires missiles. Assembly language programming yields quick, precise movement.

Some games for the IBM allow you to work from the keyboard instead of using a joystick, but at a sacrifice of control. Cosmic Crusader works quite well without the stick. The program allows you to define your own keys. As delivered, the left hand moves the ship using the z key for left, c for right and x for stop; the right hand fires missiles by punching the + key and engages shields by hitting the space bar.

The game can be started in any of its nine levels of difficulty. You begin with three ships, with additional craft awarded every 2000 points.

The screen display includes a separate section off to the right—nicely out of distracting range—which displays present score, high score, number of ships avail-

FROM TIME to time, a "refueling station" floats by.

enough to be distracting. There is also a keyboard toggle to silence the program if the boss or the kiddies are around the corner.

Cosmic Crusader was tested on an RGB color monitor. It could also be played, although with a less distinct image, on a color television using an RF modulator. It should be easy to play the game on a monochrome monitor attached

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able, number of protective shields left, and whether the game is in keyboard or joystick mode. Whenever a score is among the top six on record, the program will ask for your name to be enshrined on the Crusader Hall of Fame.

All in all, not a bad game, if you like shoot-em-ups in outer space.—C.S.

Crossfire

Sierra On-Line, Inc.
35675 Mudge Ranch Rd.
Coarsegold, Calif. 93614
List Price: \$29.95

Requires: 48K RAM, one disk drive, color/graphics adapter, color or monochrome adapter. Joystick end game adapter optional.

There is less to Crossfire than meets the eye. First of all, the exciting setting: "The aliens have landed and they are closing in. Only three ships are left to protect the city from the invaders, and you have a limited supply of ammunition.

Watch it! They're firing at you! That's it—move left, fire, back up, fire again... Keep firing at the aliens and dodging their missiles before they hit you!"

Sound familiar?

Second, the gimmick. Crossfire's supposed allure is that the aliens can come at you from any of four directions—from above, below, left, or right—on a squared-off maze that is said to represent a city map. Four different types of monsters appear at one of the sides of the screen. They move toward you, zigging and zagging around corners, or sending out missiles from afar.

The graphics are adequate, but nothing spectacular. On an RGB color display, the outline of the city is in blue and the ships, monsters, and special prizes are pink. The image would likely be a bit difficult to deal with on an ordinary color television; it would probably be possible to figure out the pattern on a monochrome monitor etched to the color/graphics board.

To its credit, Sierra On-Line has

included two photos of the screen (small but accurate) on the back of the package, so the prospective buyer should be able to get a pretty good idea of the display before heading for the checkout counter.

Astro-Directional Control

To move your mother ship, you push

THE ALIENS
have landed and they
are closing in.

the joystick control in any of the four axes; to fire a missile you depress the lower button on the joystick and quickly push the joystick in the direction the missile is to go. The action is sometimes awkward; if you leave the joystick at an angle after firing, your ship will begin to move.

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Textra runs under PC/DOs and requires 64K of memory, and will work with either a monochrome adaptor or any monitor connected to a color/graphics adaptor.

TEXTRA

keyboard, but with even less grace. Nine different keys are identified for movement and firing: I moves the ship up, K

THERE IS no reason why the program could not have been written to take advantage of the cursor keys.

moves it down, J moves left, L moves right, and the space bar stops motion. To fire: E shoots up, D fires down, S goes left and F right. If it sounds confusing, it's probably because it is.

There is no reason why the program could not have been written to take advantage of the cursor keys on the PC. I suspect Sierra On-Line used the keyboard latters on other, less-capable computers,

and did not take advantage of the PC when the game was transferred over.

The program properly recognizes when the computer has both a color/graphics board and a monochrome display board. There were no problems in operating the program, but there are a few omissions: Crossfire lacks a provision for changing the keyboard codes if you'd like to make the assignments easier (or consistent with another game). Further, there is no record on disk of past high scores; the program only keeps track of the highest score since it was most recently booted up.—C.S.

Snack Attack II

Funtastic, Inc.
5-12 Wilde Ave.
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Requires: 64K RAM, one disk drive, color/graphics adapter, color or monochrome display. Joystick and game adapter optional.

Do you know which famous arcade

game was all the rage last year? The one that was on the cover of Newsweek, or was it Time? The one that inspired a song t-shirts, contests, bubble gum cards, and decals?

Well, *Snack Attack II* looks like sounds like, plays like—and if you really want to anthropomorphize its hero—tastes like old friend Pac-Man. Only it's been subtly improved.

The setting, according to authors Michael Abrash (of *Space Strike* and *Cosmic Crusader* fame) and Dan Illowsky, is this: "You're having a Snack Attack. Your only cure is to gobble up as many gumdrops as you can grab away from the greedy gum drop guards. Watch out as the guards chase you around three different mazes full of gumdrops. If one catches you, you'll explode! To advance to the next maze, you must first eat all of the gum drops in the present maze. Each of the mazes contain special doorways, magic stars and pop-up desserts."

So much for the Pac-Man spinoff. But there are some interesting changes. The center of each maze contains a sanctuary

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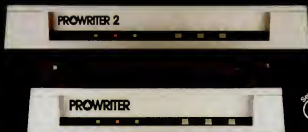
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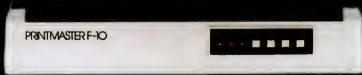
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Resident Cache Buffer Hard Disk Storage	5M/10M	—	?
OPTIONAL OPERATING SYSTEMS (Supported by Company)†			
MS-DOS (PC-DOS)	Yes	Yes	?
CP/M 86	Yes	Yes	?
MP/M 86	Yes	—	?
OASIS-16	Yes	—	?
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from the chasers. In the first meze, you can sneak away from the gumdrop guards by passing through vertical slotted doors that bar their entrance. The hiding place allows you a breather in the middle of a hectic chase, as well as a strategic bunker from which to conduct lightning guerrilla raids. Later mezas include both vertical slots and horizontal slots; the horizontal entries are open only to your pursuers, so the sanctuary is only a temporary haven.

The mezes include the obligatory energy dots, called "magic stars" in this game. Eating one changes the chased into the chaser. The guards can be eaten for a few seconds until the "magic" wears off. The snacker undergoes a subtle change in appearance to indicate his altered demeanor, looking for a few moments more like a shark than a guppy before changing back to his normal worried expression. In fact, the change was so subtle that looking for it was a bit of a distraction from playing the game.

The player can choose from six levels, which essentially vary the starting speed

of your player and attackers. The game can be played from the keyboard, using four keys for up, down, left, and right. The program allows you to set your own key choices if desired. A record of the highest score for each of the levels, together with the player's name, is maintained on disk.

THE HIDING place allows you a breather in the middle of a hectic chase.

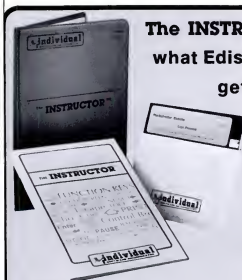
Sound can be toggled on or off and you can pause at any point by hitting the Esc key.

The screen display is an attractive one, and the mazes—particularly the second and third ones—are drawn with some

attention to competitive needs. The muncher starts in a different position in each meze, a nice touch. It should be possible to play the game on a monochrome monitor attached to the color/graphics adapter.

The play action of the game is good, although the muncher does not respond as quickly to joystick instructions as might be hoped. The game is written in assembly language, but so much is taking place on the screen that joystick commands sometimes seem to take second precedence. There is a noticeable pickup in reaction time if commands are entered from the keyboard. It also seems odd that only three mazes were included in the game, since most players will advance fairly quickly into the upper levels.

Another Poc-Mon clone, WHIRLEE (from MicroRed Associates in Kingston, N.Y., reviewed in PC, Volume 1 Number 8) seemed quicker in its responses, but lacked some of the tasty special features of Snock Attack.—C.S. /PC



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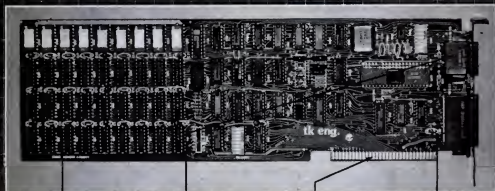
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PROJECT COST ANALYSIS

PG - 1

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Soils & Seismic	project	1,000.00	0.90	0.29	0	
Architect Fees	project	2,400.00	1.01	0.37	0	
Owner's Fee	set	420.00	0.21	0.12	0	
Structural Engineering Fees	project	300.00	0.28	0.14	0	
Heat Factor Engineering	project	150.00	0.09	0.04	0	
Plan Check Fees	project	300.00	0.18	0.10	0	
Building Permits	project	380.00	0.19	0.11	0	
Water Meter	project	450.00	0.23	0.13	0	
Telephone Expenses	month	348.00	0.18	0.10	0	
Temp Power Pole Fees	project	35.00	0.02	0.01	0	
Temp Water & Power	month	348.00	0.18	0.10	0	
Temp Power Pole	month	315.00	0.11	0.06	0	
Temp Toilet	month	640.00	0.33	0.19	0	
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Concrete Slab/Interior	sq. ft.	2,000.00	3.53	2.60	0	
Masonry Retaining Wall	sq. ft.	1,800.00	0.91	0.51	0	
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M.V.C.A.	ton	5,000.00	2.32	1.42	0	
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PROJECT COST ANALYSIS

PG - 2

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Wood Door/Window Core	unit	480.00	0.24	0.14	0	
Wood Door/Window Panel	unit	300.00	0.15	0.09	0	
Wood Door/Window Panel	unit	250.00	0.13	0.07	0	
Marble Door Seta	unit	900.00	0.40	0.26	0	
Finish Lumber/Trim	in. ft.	275.00	0.14	0.08	0	
Finish Lumber/Trim	in. ft.	440.00	0.20	0.11	0	
Finish Lumber/Special	in. ft.	285.00	0.14	0.09	0	
Vacuum System	outlet	425.00	0.21	0.12	0	
Interlock System	outlet	425.00	0.21	0.12	0	
Security System	outlet	1,210.00	0.61	0.38	0	
Cable/TV System	outlet	280.00	0.14	0.08	0	
Insulation	sq. ft.	1,750.00	0.98	0.49	0	
Roofing	sq. yd.	6,350.00	3.31	1.99	0	
Brick/Split	sq. ft.	11,375.00	0.73	0.35	0	
Finish Carpentry Labor	sq. ft.	7,380.00	2.71	1.10	0	
Cabinet/Drawer	in. ft.	1,440.00	0.80	0.48	0	
Cabinet/Drawer	in. ft.	2,800.00	1.41	0.80	0	
Cabinet/Special	in. ft.	2,700.00	1.11	0.63	0	
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Flooring/Carpet	sq. yd.	4,000.00	2.02	1.14	0	
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The C language has acquired a growing following of users and admirers since its development and first implementation by Dennis Ritchie at Bell Labs in the mid-1970s. The popularity of the language is due largely to its balance of speed, portability, and simplicity. Unlike many other high-level languages, C has a pragmatic, nuts-and-bolts structure that lets a good programmer get close to the machine's capabilities when necessary, yet retains the classic advantage in high-level languages of superior productivity. C is a good choice for inherently complicated programming projects—word processors, operating systems, and compilers—that should, nevertheless, run very quickly. The most outstanding testimonial to the power of the language is that Unix, the popular operating system, is written entirely in C.

Is C a good language for you? That depends on what you want to do. If your programs are small and simple, need to be changed often, and are only intended for personal use, then the answer probably is no. BASIC would be a better language for you. The expense of a compiler, the hesi-

lance of waiting for a program to compile after making a change, and the difficulty of learning a new language outweigh the advantages offered by C. Some built-in capabilities are provided by BASIC, such as the graphics commands, that a C programmer would have to write from scratch. But C is much more suitable for writing large programs because it allows you to break up a program into smaller, more manageable chunks. Writing a professional-quality program in C is easier because of this block structure. C programs run faster and are easily moved to other computers.

C certainly looks different from BASIC. When you view a listing of a C program (see Figure 1), instead of familiar pseudo-English commands and statements, you'll see variable names and what appear to be punctuation marks. These symbols—the functions and operators of the C language—take the place of the statements used in BASIC. This listing may look rather intimidating to the uninitiated (as do all computer programs!), but thousands of C programmers can say from experience how quickly it

becomes easy to read.

Anyone interested in this language should read the standard C reference work by Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language* (Prentice-Hall, 1978). Like the C language itself, the book is clear but quite spare. Be warned that the lack of fluff in this book will be pleasing only if you're already familiar with a compiler language. It is a high-protein tutorial. Using any of the compilers reviewed here will require familiarity with the language and ideas mentioned in this book.

What should you look for in a compiler? Its primary purpose, of course, is to make the task of writing programs as easy and pleasant as possible. I first look for language features that will allow structured programming, which makes use of conventional control and data structures such as subroutines, if-then-else statements, and local variables. Most modern languages, C included, are acceptable on this count.

Debugging aids score high on my compiler checklist. I make lots of mistakes and any help the compiler can provide is



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appreciated. I demand that a compiler should be fast, allowing quick tests without long waits, and it should give specific error messages. I prefer compilers that catch lots of errors, like those available for Pascal, but since C is not a strongly typed language (unlike Pascal), such detailed messages aren't coaxed out easily. Unlike Pascal compilers, none of these compilers provides runtime array boundary checking or arithmetic overflow checks. Some C systems have clever utilities (often going by the name of "lint") that catch the sort of dubious programming constructs

that Pascal compilers outlaw; I was disappointed to find that none of the four products I reviewed included a version of the lint utility.

Next, a compiler should permit full exploitation of the capabilities of the PC. The current crop cannot address the full megabyte of memory capacity in the machine. This felling is a tremendous restriction, as one of the principal joys of working with the PC is playing with all the cheap memory that it makes available. While none of the compilers I tested could access the PC's full megabyte of

memory, versions that include this ability will soon be available. The tested version of C/C86 did have rudimentary overflow support, an awkward way of squeezing a lot of code into a small space. Given the addressing restriction, it's important to be able to interface easily with programs written in other languages, principally assembly language.

My final general criterion for good compilers is that programs produced on them run quickly and use as little memory as possible to accommodate users who don't have truckloads of patience or RAM.

Features of C Language

For C compilers in particular, there is another important feature to consider. The author of the language makes a distinction between the language itself and the set of standard functions (subroutines) that provides interfaces to the file system, to the screen, and to other operating system features. This standard set of functions, called the "standard I/O library," should be included with every C compiler. Several compilers, though, provide a nonstandard library, which greatly hinders moving code from one system to another. I look for a standard library.

There's one thing I don't want to find in a C compiler: enhancements. Nearly every Pascal compiler extends the basic form of that language in one way or another; that's because standard Pascal is too limited to be usable. C isn't like that. The standard language is good enough, and the value of benefits from extensions pales when compared to the cost of losing the option to move the C code freely to another compiler or computer.

C88

The first compiler to arrive was C88 from Intellect Associates Inc. Its package included a disk and 50 pages of loose-leaf mimeographed documentation.

This documentation proved to be inadequate. The information is all there, actually, but it took more than a few minutes for me to figure out how to link edit compiled programs. I had to root around in the manual without guidance before I understood just which files needed to be included. The manual is poorly organized and has no index. Items of vital information are often buried in the text.

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c-window systems is to be commended for including an excellent source-level debugger with its C compiler. This sort of tool can make writing programs a much more pleasant task, but surprisingly few have been made available. A source-level debugger is a utility program that allows a program to be viewed as it runs. Typically, it enables you to trace through the program one step at a time, displaying variables and following the logic of the source program to identify and locate problems.

When you buy PC-DOS, a machine-level debugger (the Debug program) is

included. It also allows you to trace the execution of a program, but only at the machine level—through memory locations and registers. This doesn't do much good when working with a compiled program, because the machine code the debugger displays looks nothing like the C code you wrote. A source level debugger, such as c-window, traces through the original code, keeping track of the C statements rather than memory locations.

C-window, like other debuggers, displays variables and set breakpoints. This package goes beyond the ordinary with two exceptional features. It displays the output of any arbitrary C expression, not just that of a program variable. You type in the expression, and c-window calculates and displays the result. This is handy when an expression isn't acting the way you expected; it lets you play around in ways that may solve the prob-

lem. Another nice touch is the feature called "expression breaks." You can specify a C expression to be continually reevaluated as the program runs. Whenever the value of the expression becomes nonzero, execution stops and you can poke around in the program to find what happened there. Expression breaks are a useful bug-hunting tool.

With good things there's often a catch, and the catch to c-window is that you need a printed listing of the source in order to use it, since the package prints out only the line number, not the line of C source, to tell you where it is in the program. That's a pain, as most programmers don't like to stop to print a listing every time a program is recompiled. I also suspect that many programmers don't even have a printer. A utility program that will print numbered listings is supplied by c-systems with its compiler. —H.H.

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Figure 1: The benchmark program in C language

```
/* Eratosthenes Sieve prime number calculation. */

#include "stdio.h"

#define true 1
#define false 0
#define size 8190
#define sizepl 8191

char flags[sizepl];

main ( )
{
    register int i,k;
    int prime,count,iter;

    printf("100 iterations\n");
    for (iter = 1; iter <= 100; iter++)
    {
        count = 0;
        for(i = 0; i <= size; i++)
            flags[i] = true;
        for(i = 0; i <= size; i++)
        {
            if(flags[i])
            {
                prime = i + 1 + 3;
                k = i + prime;
                while (k <= size)
                {
                    flags[k] = false;
                    k = prime;
                }
            }
            printf("\n%d", prime); /*
            count++;
        }
    }
    printf("\n%d primes",count);
}
```

C86 compiles only a subset of the standard C language. It offers limited data types: no structures, no floating point numbers, no unions. It doesn't have assignment operators, and the function library supplied with it is incomplete. To its credit, the compiler includes a number of useful library routines to access the video screen and PC-DOS functions. Source code for the library is not provided. The compiler generates nonstandard object files that are compatible only with the L86 link editor supplied with this compiler. Unfortunately, this means there's no convenient way to interface with assembly language programs.

I had trouble when I tried to move

standard C programs to this compiler. A number of widely used C features are not included (assignment operators, for example); to make matters worse, some standard constructions have a distinctly different meaning to C86. Because C doesn't support multidimensional arrays, only vectors can be indexed. But if you used standard C code, which uses double indexing in support of arrays, the C compiler would misinterpret that double indexing by indexing into the vector twice instead of giving a warning message. This is a trap for users familiar with standard C languages.

The compiler was easily confused by errors in the C source code. Instead of

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ing a diagnostic message and then resuming its checking operations, it often presented a quite reasonable diagnostic message and then proceeded to get horribly confused, giving out all sorts of spurious error messages. On several occasions the C88 compiler became so entangled that it crashed, and the operating system had to be reloaded. Unlike the other compilers I tested, C88 doesn't allow command line



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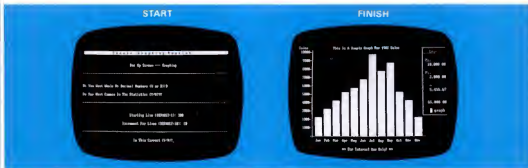
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redirection of standard input and output files. The one endearing feature of this product is that it compiled the benchmark test very quickly.

c-systems C

c-systems sent me a C compiler with good documentation and none of the problems that came with C88. The version I tested did not accept full C, but came very close. Its author assured me that the remaining constructs from the

S
***SUPERSOFT C**
produces code that
later must be
assembled separately.*

standard language would be supported in the next version, scheduled for release early this year. The outstanding feature of this compiler is its c-window package, a symbolic run-time debugger.

The code it compiles is fast—the fastest of the five compilers in my test. The compiler produces assembler code, which then has to be fed into the IBM Macro Assembler. This is an annoyance because the Macro Assembler costs about \$100 and it's slow enough to make it tiresome to compile large C programs.

The documentation is thorough, but lacks an index and an explanation of compiler messages. While it provides the standard C function library, it includes neither source code nor heap storage management routines. The c-systems compiler does not support floating point. I encountered problems while moving UNIX C code to this compiler since the version I tested still had some standard features missing.

One special feature this compiler has is a PL/M compatibility mode, in which the compiler generates function call code compatible with the PL/M programming language. The assembly language interface is well documented and easy to use. Code, but not data, can span several 64K segments.

The compiler recovered well when it found errors in the source code. In that test it gave clear messages and told no tales of spurious errors.

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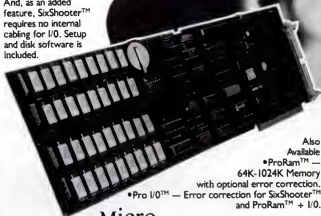
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CI-C86

CI-C86 from Computer Innovations accepts the full C language, comes with every complete superset of the standard library (and in source, too!), and is well documented. Among the five tested compilers, only CI-C86 provided floating point support (IEEE standard format—the best) and heap storage management functions. Support for the Intel 8087 chip is provided by library routines, although the manual promises that in-line support will be in an upcoming version. The version of the compiler I tested produced object code compatible only with the supplied CI-C86 linker—a weakness that should be remedied (the manual promises standard object files are coming). The apparent advantage of the CI-C86 linker over the DOS linker is that it doesn't include unnecessary library files.

An assembly language interface is provided by a conversion program that reformats standard object code files for the CI-C86 linker. This works, but it would be more convenient to use standard files directly. Although this compiler, like all the others, is limited to 64K of data, some support for overlays is provided.

The compiler recovered well from syntax errors in the source code, but I had

C CERTAINLY
looks different than
BASIC.

trouble understanding a few of its error messages. An explanation of the error messages would be a welcome addition to the CI-C86 manual.

Telecon C

Like CI-C86, Telecon Systems' C compiler supports the full language, although the version I examined did not include the floating point support option. Its documentation is incomplete, the worst of the five tested. The instructions that explain the invocation of the compiler are incorrect. Fortunately, the compiler itself is simple to use, so that a little experimentation cleared up my questions. Still, I expect a manual to provide more.

The Telecon C compiler, like the c-

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systems and SuperSoft products, generates assembler code that must be assembled and linked separately. To my surprise, the entire standard function library is recompiled along with every user program. A small program generated a 40K assembler file, which took just short a forever to assemble. Apparently the scheme is not unusual for compilers running under operating systems that don't have relocating linkers. PC-DOS has a relocating linker, but versions of Telecon C are also offered for other, less well-

UNIX, THE popular operating system, is written entirely in C.

equipped systems. Presumably the same compilation scheme is used for all versions, and the PC-DOS version must suffer for the weaknesses of its siblings.

The performance penalty, you'll notice, is staggering. I suppose one could rewrite the standard library a bit (source is provided), so only the "headers" are included in the compilation (that's how the other compilers work), but that job really shouldn't be the user's responsibility. To its credit, Telecon C has a number of true cross compilers available; these are great if you want to use the PC as a development tool for another microcomputer. Code generators are available for the 8080, 6809, PDP-11, and 8086 architectures that run various operating systems. The standard input/output library is complete, but no heap storage management routines are supplied.

The Telecon C produced obtuse error messages, and this compiler did not recover well from syntax errors. Spurious errors were commonly generated after a legitimate error was discovered. I once reached an internal limit—the literal table overflowed—while compiling programs of only moderate size, but encountered no other bugs.

SuperSoft C

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but it was all downhill from there. Once I was inside its covers, the documentation, or the lack thereof, really soured me. This product bears all the signs of having been converted from a version for another computer and rushed to market well before its time. The manual was written for CP/M users, and doesn't offer a clue as to how someone using PC-DOS should fire up the beast. The way to do it isn't obvious,

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either. I spent a good two hours exercising my ingenuity, trying to compile the sample programs. (Remember that I had already mastered four other C compilers.) No luck. Finally I swallowed my pride and called SuperSoft. A quite knowledgeable staffer helped me out, and that was that. Still, by including even a single photocopied page with the necessary instructions, SuperSoft would have saved me time and a phone call. Considering the high price of this program, the lack of clear instructions is shameful.

The compiler itself proved to be a marginally adequate subset of C. It does not include static declarations or data initialization, two features from the standard language that stand high on my "must have" list. Like the Telecon and c-systems compilers, SuperSoft C produces code that later must be assembled separately. This takes time. The assembly language interface was not explained. In poking around a bit, I noticed that the designers chose to use an unusual mechanism for function calls that requires some functions to be specially declared—this is a deviation from the standard. The compiler has no provision for redirecting standard input and output files, a deficiency it shares with C88. The source code for the library is provided, and the manual discusses various strategies to reduce the size of an executable file by reorganizing the library.

I found the error messages obtuse. "Disk Full" conditions, for which I usually

get a lot of error messages, are noted by nothing more than an "output file error" message, which then rolls off the screen in less than a tenth of a second. Some errors slip by the compiler and don't get caught until assembly time, which of course results in a message that bears no relation to the original error.

This was not my favorite compiler, but in fairness I should mention that SuperSoft has a new version in the works, as does everybody else in this field. A new manual is supposed to be published soon. The current manual, like all the others, lacks a list of error messages.

Missing Language Features

Four of the five C language compilers reviewed omit some features of Kernighan and Ritchie's standard C language. The following is a list of omissions.

C88:

- structures
- unions
- multidimensional arrays
- floating point
- long integers
- functions return only integers
- unary "sizeof" operators
- casts
- assignment operators (i.e. +, =, *, etc.)
- storage classes: auto, static, extern, register, typedef
- goto statements
- parametrized macros
- pointers restricted to char and int

c-systems

- external data initializers
- casts
- typedef
- floating point

Cl-C86

All standard features are included.

Telecon C

- floating point (available as option)

SuperSoft C

- storage classes: static, typedef
- data types: long, double, floating point
- initializers
- bit fields
- parametrized macros
- conditional compilation (preprocessor directives)

Remember that none of the tested compilers can address more than 64K of data.

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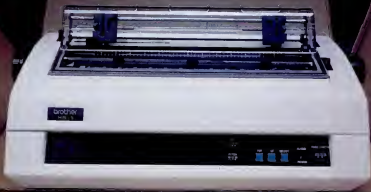
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Figure 2: Benchmark results for five C compilers. IBM Pascal and BASIC results included for comparison.

COMPILER	Large Compile	Compile	Runtime	.exe File Size
C86	2:53	1:14	0:29.8	15,360
c-systems C	15:15	1:28	0:15.0	24,960
Ci-C86	4:02	1:25	0:17.3	12,672
Telecon C	51:24	15:30	0:24.7	15,872
SuperSoft C	29:44	2:04	0:24.8	24,832
IBM Pascal: compiled			0:12.0	32,512
IBM BASIC: compiled, standalone			0:16.0	18,432
IBM BASIC: interpreted			33:67.0	n.a.

Benchmark Results

Some compilers are faster than others. To get an idea how fast each is, I ran a few benchmarks. The algorithm I used for the runtime and file size comparisons was the popular Sieve of Eratosthenes, a procedure to sort out prime numbers. The same algorithm was used in "A High-Level Language Benchmark," an article in the September 1981 Byte. This was a very small program (about 30 lines), so compilation times were near the compiler's minimum. The compilation time figure includes time for running the assembler (for the three compilers that needed it) and for linking the executable file. Note that the size of the executable file does not directly reflect the compactness of the compiler output; it does, however, reflect the size of the library routines automatically linked into the file. SuperSoft C, Ci-

benchmarks.

In Figure 2, the Large Compile benchmark is the time it took to compile and link a 500-line C program. The other three values—Compile, Runtime, File Size—are the results from running the shorter Sieve of Eratosthenes program. For comparison, runtime speeds and executable file sizes are included for IBM's BASIC and Pascal (these results are from Will Fastie's IBM column in the February 1983 issue of Creative Computing). Note that although all of the compilers produced very fast code, there are significant differences in their compilation times.

All benchmark results should be taken with a hefty pinch of salt. That's because your programs are going to use a different mix of language features than those of the benchmark, and because compilers that are efficient on one language construct might not be quite so good on another. The sieve program is popular because of its simplicity. But that's also its weakness as a tool, because it really doesn't exercise much of the compiler. Notice, for example, that the program doesn't include a single function call for a subroutine. A real C program would contain dozens of function calls, and there are indeed good and not-so-good ways for compilers to implement function calls. If a program is slower in this test by a factor of ten, that's significant. Differences of less than 50 percent are inconsequential.

General Observations

Reliability is an exceptionally important quality of a compiler. Nothing is more frustrating than writing a perfectly valid program, only to discover that the compiler won't correctly translate it. Having a compiler that accepts invalid code is equally unacceptable. Unfortunately, compiler reliability is quite difficult to assess. I should admit that I did not attempt to validate these compilers. Use

them, yes; validate them, no.

Theoretically, all these compilers may run on a single disk system, but I would strongly recommend using a double drive system, preferably with 320K disk drives. All compilers ran well on my 128K PC-DOS system. None of these programs is copy protected. All allowed separate compilation of modules, although Telecon C doesn't mention how to do this. The Telecon, SuperSoft, and c-systems compilers require the Macro Assembler from IBM, which increases the effective price of these compilers. All generated impressively fast code; even the slowest was very good. The quality of the tested compilers varied quite a bit in their error diag-

**A REAL C
program would
contain dozens of
function calls.**

nostics, their compilation speeds, and the language features they supported.

None of these compilers is spectacularly documented. Errors usually occur because their causes are rarely self-explanatory or self-evident to the person who made them; providing a list of error messages that includes thorough explanations would have been a great help. Similarly, an index is a must.

An annoying side of writing reviews of this sort is that they will be partially out of date by the time they reach the readers. These Compilers are produced by small, highly competitive firms, and they move fast. Several of these manufacturers are preparing more capable versions of their products as I write this article, and they might even be available when you read it. But, as of right now, two compilers—Computer Innovation's Ci-C86 and c-system's C—clearly stand above the rest. Ci-C86 accepts the full language, compiles quickly, and includes a full-featured library. The c-systems product has an outstanding debugger, the best manual, the best assembly language interface, and produces somewhat faster code. These two compilers are quality products sure to be used as valuable tools by software developers. /PC

**THESE C
compilers are
produced by small,
highly competitive
firms, and they move
fast.**

C86 and Telecon C provide the library in source form, so a sophisticated user could presumably find a way to cut the size of the file substantially whenever some of the capabilities weren't needed. The programs ran for 100 iterations, enough times to reduce the significance of the program lead time, which is influenced more by such factors as disk allocation. I then divided that time by 10 to make these results comparable to other published

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CIRCLE 254 ON READER SERVICE CARD

Designed especially for the PC, MultiMate appears to be leading the pack in the race to make microcomputers act like dedicated word processors.

The Dedication Of MultiMate

MultiMate (WordMate)
Softword Systems, Inc.
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List Price: \$495

Do you love your IBM PC, but still look covetously at your neighbor's WANG word processor from time to time?

Do you wish you had a keyboard that could store a file with a single keystroke? One that could identify and move a block of copy about as fast as you could point to a "before" and "after"? And how about a word processor that allows you to zip from page 78 to page 4 in three keystrokes or from anywhere in the copy to the beginning or end in two?

Well, it may soon be your neighbor's turn to be green with envy. MultiMate, a

new entrant into the already-crowded word processing market for the PC, virtually remakes your computer into a WANG-like dedicated word processor.

MultiMate is very fast, easy to learn, and capable. Planned enhancements will

MULTIMATE
*virtually remakes
your computer into a
WANG-like dedicated
word processor.*

take it into worlds where no microcomputer-turned-word processor has gone before.

Although the program does use menus



to go from start to creation of a file, editing, printing or file handling utilities, it is not quite accurate to say that MultiMate is menu-driven. Almost every command is available at any time from a combination of Alt, Ctrl, Shift, Function, and alphanumeric keys.

The only real problem is the result of an embarrassment of riches. The user is presented with more options than a 4-year-old given free run of a toy shop.

The Keys To MultiMate

MultiMate makes full use of the PC's keyboard, including the assignment of 31 different tasks to the ten function keys. It puts particular reliance on the often-overlooked Alt key, which some typists find easier to locate on the IBM PC keyboard than the Ctrl key.

As an example, typing the F1 key produces the "Go To []" message for mov-

Figure 1: A partial list of functions and keys to press for help.

FUNCTION	KEY(S)	FUNCTION	KEY(S)	FUNCTION	KEY(S)
FORMAT CHANGE	F9	FORMAT CURRENT	Shf F9	FORMAT DELETE	O
FORMAT LINE	F8	FORMAT PAGE	Alt F9	FORMAT SYSTEM	Ctl F9
GOTO	F1	GOTO PLACE MARK	Ctl F1	HARD SPACE	Alt S
HEADER	Alt H	HELP	Shf F1	HIGHLIGHTING	H
HOME	Home	HYPHEN (soft)	Shf F7	INCENT	F4
INSERT	Ins	LIBRARY	F5	LIBRARY ATTCH	Shf F5
LIBRARY OOC	L	LINE HIGHLIGHTING	Alt F6	MERGE CODE	Alt M
MERGE PRINT UTIL	Alt 5	MOVE	F7	NEXT PAGE	Ctl PgOn
NEXT WORD	Ctl D	OTHER UTILITIES	Alt 7	PAGE BREAK	F2
PAGE COMBINE	Shf F2	PAGE DOWN	PgOn	PAGE LENGTH	Alt F2
PAGE UP	PgUp	PARAGRAPH HILITE	Alt F8	PREVIOUS PAGE	Ctl PgUp
PREVIOUS WORD	Ctl B	PRNT CUR OOC UTL	Alt 3	PRINT CTL UTIL	Alt 4
PRINTER CTL CODE	Alt A	PRINT PITCH	Alt C	REPAGINATION	Ctl F2
REPLACE	Shf F6	RORD PAGE BREAK	Alt B	RETURN	R
RETURN TO ODS	Alt 9	SAVE	Shf F10	SAVE/EXIT	F10
SCROLL LEFT	Alt F3	SCROLL RIGHT	Alt F4	SEARCH	F6
SENTENCE HILTING	Alt F7	SET PLACE MARK	Alt F1	STOP PRINT	Alt P
STRIKEOVER	S	SUBSCRIPT	Alt W	SUPERSCRIPT	Alt Q

Press Return to exit. '-' to scroll up. '+' to scroll down

S: * N:

ling within the document. Holding the shift key and typing F1 accesses the Help messages (see Figure 1) and tutorial programs (see Figure 2). Alt F1 sets a place mark in copy and Ctrl F1 brings the cursor to the next place mark you've set.

To help you remember which key does what, the program comes with a set of color-coded stickers that you can attach to the front slope of your keys. I found the stickers unnecessary, since the combination of an excellent manual and a layout chart helped me learn the system very quickly.

THERE IS no real advantage to installing more than 128K RAM for MultiMate.

The program comes equipped with a mail merge capability. It also offers the ability to call up an unlimited number of phrases or paragraphs for insertion into a document as needed. You can work on one document in the foreground while the program manages the printing of a second in the background. And, MultiMate includes a function that searches for key words in the document description page that accompanies each file—making

your word processing files into a mini-database.

All of the default settings of the program, including choice of format, printer settings, justification, and assignment of tasks to particular drives can be set by the user. MultiMate will start a new document in the manner you choose, not one selected by an anonymous programmer who has never typed anything more formal than a line of machine language code.

What's more, enhancements scheduled for the coming year include a full-blown database manager that use MultiMate-created files, an electronic spread sheet, a dictionary, and a custom communications package. (MultiMate was born in January but underwent a name change in January in anticipation of the release of its related modules.) A few minor shortcomings may be taken care of in coming updates of the program—the purchase price of MultiMate includes the first two such revisions free, with extended service available for \$50 per year.

The prime benefit of the design comes in the form of speed. A common function performed on MultiMate can take fewer than half the keystrokes required by WordStar, for example. Because MultiMate was written specifically for the PC, it can take advantage of some special design elements to shave full seconds here and milliseconds there.

Included among MultiMate's bells and

MULTIMATE
will allow use of the
expanded and
compressed typefaces
offered by dot matrix
printers like the Epson
MX series.

whistles is a reminder at the bottom right corner of the screen that indicates with an arrow whether the keyboard has been upshifted or the Num Lock engaged—two annoying quirks of the IBM PC keyboard dealt with in a single line! The screen also indicates when the Alt or Ctrl key have been depressed and displays Insert, Delete, Copy, Print, and other modes and messages in the upper right corner.

The Birth of MultiMate

The similarity to a dedicated word processor like your neighbor's WANG is very deliberate, and thereby hangs the unusual tale of the creation of MultiMate. The program was written by W.H. Jones & Associates, Inc., a Connecticut custom software house, for Connecticut Mutual Life Insurance Company. The life company had found itself with a new herd of IBM PCs mixing in with an established



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stabilized WANG dedicated word processors. It was looking for a way to avoid training secretaries, agents, and executives on two different systems. In addition, Connecticut Mutual wanted to use its PCs to manage its data base, store files and correspondence, and make use of a large library of boilerplate phrases and descriptions that could be called up for insertion into any document.

Connecticut Mutual seems to have gotten what it asked for. MultiMote is obviously designed for large offices that may have a number of IBM PCs linked into shared disk drives and printers. The various special features incorporated in the program should also be of great use to individual users.

Program Requirements

MultiMote requires 128K RAM in the IBM PC, principally because of its emphasis on speed, its background printing abilities, and its easy manipulation of large chunks of copy, including phrases and paragraphs inserted from the library. The program is entirely resident in RAM during operation.

MultiMote only goes back to the program disk for instructions to read help messages or printer format codes.

At the same time, there is no real advantage to installing more than 128K RAM for MultiMote, according to a programmer at the company. Because the program divides copy into pages, additional internal memory is not used.

The only limit on the size of the document is the storage space on disk; the program is designed to run with at least two disk drives. A single-sided data disk will store as many as 100 pages of copy, while a double-sided floppy will handle twice that amount. A setup utility allows you to specify two or more floppy disk

drives as repositories of the system, document, and library files. It also accommodates hard disks and shared disk systems although those features were not tested for this review.

It would be possible to run the program with a single double-sided disk drive by specifying Drive A as both program and document drive, but the size of the MultiMote program would leave room for only about 25 pages of copy. You could save room on the program disk by removing the help messages (58K of disk space), recovery program (27K), and unnecessary printer protocols (2K each). Another option would be to load the MultiMote coding into a block of RAM set up as a "RAM drive." This fools the computer into thinking it has another floppy disk.

**IT'S POSSIBLE
to call for different
headers or footers on
alternate pages.**

But it really doesn't pay to scrimp if you're planning to use MultiMote. The program places a great premium on speed and capabilities. Forcing it to work in a tighter environment than recommended would be like running a Porsche on square wheels.

MultiMote divides documents into pages. The default limit for each page is 66 lines, but the program can handle pages of about 150 lines before RAM is filled and you are asked to end the page.

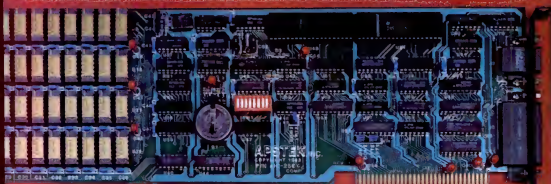
The version of MultiMote reviewed for this issue was set up to run an Epson

Figure 2: Example of one of MultiMote's tutorial screens (from REPLACE Sht F6), available from within program at any time.

1. Move the cursor to the position where the Replace function is to start.
 2. While holding down the Shift key, press the Replace function key (F6).
(The system will prompt you from this point on.)
 3. Press the number key '1' for Global Replace.
Press the number key '2' for Discretionary Replace.
Press the number key '3' for Abort to cancel this statement.
 4. Enter the character string you want the system to search for and replace.
 5. Press the function key (F6).
 6. Enter the replacement characters or text.
 7. Press the Replace function key (F6).
- Press Return to exit

S: H: N:

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QUIKCALC.
the calc accessory

MX-80 with Graftrax and a Smith-Corona TP-1 printer. Softword Systems says it also intends to support the IBM dot matrix, Centronics, IDS/Prism, NEC, Okidata, C. Itoh, Brother, Qume, Diablo, and Royal printers as well as devices that require only nonspecific TTY coding. A coming enhancement of the program will include a customization program for other printers; in any case, Softword Systems says it will customize the program for unusual printers if a client makes such a request and supplies necessary technical data.

THE PROGRAM is not copy-protected and owners may make backups for their own use.

The program will issue commands for boldface, superscripts, subscripts and underlines from within the copy if your printer supports these enhancements. On a monochrome display driven by IBM's monochrome video adapter, the underlines will appear on the screen; on the system I used (a color/graphics adapter driving a monochrome monitor) there was no indication that underlines had been ordered, which I found a bit of a disadvantage.

MultiMate will also allow use of the expanded and compressed typefaces offered by dot matrix printers like the Epson MX series and its near-twin the IBM printer. You can either specify on the printing format page that the entire document be printed in compressed or expanded type, or you can specify a change in type pitch and size within a document by typing an Alt C and a pitch indicator number listed in the menu, and get this.

The program allows you to embed printer control codes in copy to call upon any special features of your printer. The control codes are issued by typing an Alt A followed by the ASCII code specified by your printer manufacturer. As an example, after consulting the instruction manual for my Epson MX-80 printer for guidance, I was able to call up a line of



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itetics in the middle of a page of ordinary print by specifying ASCII codes 027 (Esc) and 052 (4). These codes yield a line of

No WORD
processing
programmer has yet
come up with a
foolproof system to
hyphenate the
sometimes perversely
illogical English
language.

itetics. And then, combining a change in pitch and a call for itetics, you could specify a subhead

like this.

MultiMate allows for headers and footers as long as five lines each, and control codes such as boldface and expended or compressed print can be included in the copy. It will include automatic page numbering if you wish, and it's possible to call for different headers or footers on alternate pages.

Preparation

The manual provides clear instructions for setting up a program disk for users of both single- and double-sided disk drives. The program is not copy-protected and owners may make backups for

their own use.

The size of the program and its need to store blocks of copy temporarily during copying and moving functions requires owners of single-sided disk drives to use two separate disks for loading the program: a "boot" disk containing the word processing instructions that are held in the computer's RAM and a "system" disk that contains help messages, format and printing defaults, printer tables, and other elements that the program needs to refer to during operation.

Double-sided systems can hold the entire bulk of code on one disk. (As configured for the two printers in my system, MultiMate plus COMMAND.COM takes up 218,112 bytes.)

Also included in the start-up section of the manual are instructions on formatting document disks, and explanation of the need for backing up document disks and appropriate warnings on handling of the magnetic floppies.

Start-up

When you first start up MultiMate, you are greeted with a short and simple menu:

- 1) Edit Old Document
- 2) Create New Document
- 3) Print Document Utility
- 4) Printer Control Utilities
- 5) Merge Print Utility
- 6) Document Handling Utilities
- 7) Other Utilities
- 8) Return to DOS.

When you type in a 1 and a return, a new screen is displayed, under the title "EDIT AN OLD DOCUMENT." It asks

Figure 3: The mini-data base for each word processing file prepared with MultiMate.

Document	EXAMPLE-1
Author	Corey Sandler
Addressee	PC Magazine
Operator	cds

Identification key words:
 Example of Document
 Summary Screen from
 MultiMate

Comments: This space is reserved for any comments, reminders, corrections you want to include in the document summary.

Creation Date	12/05/82
Modification Date	12/05/82

Use tab keys to change fields—Press F10 when finished
 If creating a Library Press F5 (do not fill in screen)

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ingeniously, "What is the name of the old document?" Displayed below the query are the names of stored files from the disk. If you are coming back into the program from another function such as printing or deleting a file, the menu will display the name of the last document you were working on. If that's the one you want to edit, you merely press the return key again. If you want a different file, just type over the displayed file name and enter. If you misspell the name of a file, ask to edit a file not yet created, the screen politely replies, "SORRY, THE DOCUMENT DOES NOT EXIST."

Creating a new file follows a similar pattern, with another polite error message if you try to create a file with the same name as an existing document: "SORRY, THE DOCUMENT ALREADY EXISTS."

The next display is called the "Document Summary Screen," which is the built-in mini-data base of MultiMate (see Figure 3). The name of the document is automatically entered on the form, as is the creation date and the date of the most

SETTING
a format for screen display and eventual printing is a breeze, and MultiMate allows for an unlimited number of format changes in a document.

recent modification. The summary screen gets its information on time and date from the DOS sign-on or from an automatic entry provided by a clock board you may have installed in your PC.

You are able to enter information on the form in the following categories: author, addressee, operator, identification key words, and comments.

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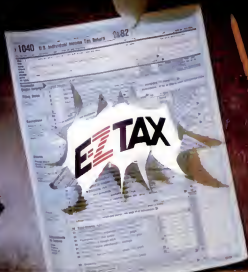


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great value to offices in which one printer serves several computers. Second, and perhaps most important, MultiMate allows you to search through all of the files on a word processing disk to find particular entries, matching any element of the summary screen: the initials of the author, the name of the addressee or operator, one of the key words, or a phrase in the comment section. You can also search for any documents created or modified on a particular date or between any two dates you specify. The search utility lists the names of any documents that include the words you've asked to match.

As an example of one use, a number of computers could share a single hard disk storage system, with operators searching out their own documents on the basis of their names or code words in the summary form. MultiMate would also allow a user to maintain a file of all correspondence on a word processor disk—like a jumbled stock of papers in a file drawer. It would be possible to check the files for a particular letter writer or recipient or recall the activities of a particular date using the search commands.

MULTIMATE really zips along.

The summary screen completed, hitting the F10 function key takes you to the first page of your document. At any point in editing, you can skip ahead or backward to a specific page by typing the F1 key. A message at the bottom left corner asks: "GO TO PAGE []?" Type the page number and hit Return and very quickly you're at the page you asked for. You can skip directly to the first and last page of the document by entering the home or end key in response to the question.

MultiMate also allows you to set any number of markers in your copy and skip to them. Unlike WordStar, the place markers stay with the copy, even after you save the document. You delete the markers by typing over them with a new character. However, MultiMate only allows you to search for them from the front of the document to the back.

The MultiMate screen displays 22 or 23 lines of copy on your screen,

depending upon where you are in your editing. Every page gives over line 14 display of the document name and page line and column number. The upper right hand corner indicates the selection of one of the editing modes and the display of related messages such as "Move What?" and "Move Where?" The bottom-most line is used for error messages and the display of the shift and numeric lock indicators. The second line of the screen is used to display the document format, and scrolls off the screen after 22 lines of copy have been entered.

The program does not insert blank lines between lines of type if you specify double-spacing in the format. This is a feature offered by WordStar, and it can be of some help for tired eyes even if it does reduce the amount of copy on the screen by half.

The program uses many of the special symbols available with the IBM PC to indicate boldface, expanded print, hard spaces, and the like. Remember, however, that underlines are not displayed on a monochrome printer driven by a color graphics adapter.

The program also does not allow the user to suppress display of the special characters—this is one of the unsung virtues of WordStar's Ctrl OD command. This feature is valuable if you are attempting to line up columns of type or numbers. MultiMate makes it doubly hard for such efforts since the column counter of the screen indicates that a space is taken by all characters, including the nonprinting control symbols.

Another missing feature is a margin release. This, combined with the absence of an automatic hyphenation function, can make it difficult to produce copy with lines of nearly equal length.

Software's explanation for the missing hyphenation subroutine is that no word processing programmer has yet come up with a foolproof system to hyphenate the sometimes perversely illogical English language. This is true, and as a matter of fact, I never use automatic hyphenation functions on word processors or typesetters I have operated; however, there are some applications where a microspaced right-justified, and hyphenated block of copy is required. A hyphenation function—even a flawed one—would help speed the process, and that is the purpose of a word processor.

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Formatting Copy

Setting a format for screen display and eventual printing is a breeze, and MultiMate allows for an unlimited number of format changes in a document. The default format calls for single-space printing; 75-character width; and tabs set at columns 5, 10, and 55. The program offers the ability to change the default settings to any format you prefer; I set it so that the program begins a new document with double-spacing; 65-character width; and tabs at 5, 10, and 45.

If the job you're working on requires a format other than the default you've chosen, you type the F9 function key at the start of typing. The cursor moves to the second line where the first entry is a number representing line spacing. You may choose from 1, 2, or 3 for single-, double-, or triple-spacing; H for half-spacing, Q for quarter-spacing, and 0 for suppression of line-spacing. The fractional- and zero-spacing formats could be used for special effects including graphics and intentional overstrikes of whole lines.

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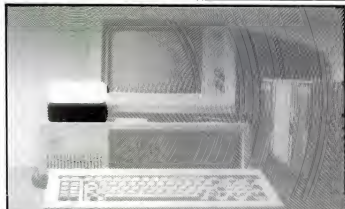
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WHETHER
you'll notice the speed
from fingertips to
screen depends upon
how fast you type.

To set tabs, you move the cursor to the chosen position. Using the spacebar will erase all tab settings as the cursor moves; using the right arrow will leave previous settings unaltered. Then press the tab key. A small double-arrow appears in the format line at the position you've selected. The same symbol is generated on the screen when you use the tab key in writing.

Finally, to set the right margin, you use the right arrow to move the cursor to whatever column number you'd like (the column indicator gives a listing throughout the format selection process) and then simply use the Return key. The line of dots that indicates the format halts at the position you've chosen. Type the F9 function key and the format is completed; you're ready to write or edit.



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The program allows lines of up to 132 characters in length, with the copy scrolling horizontally across the 80-column video display.

The format can be altered at any point. A change made at the top of any page reforms all copy on that page immediately. If you insert a new format line in the middle of a page, it will change copy which follows on that page.

MultiMate makes a valuable and convenient distinction between a "tab" and an "indent," which results in blocks of text or tables that can be easily entered without changing formats. You set the indent positions on the format line in the same manner as the tab stops. Typing the F4 function key instead of the tab key, though, sets a temporary left margin. The control is left in place until the return key is typed (see Figure 4).

MultiMate also offers a decimal tab function, which is of great value in aligning columns of numbers for tables. Characters will shift to the left of the tab setting as they are entered until a period is typed. The period will remain at the tab position and subsequent characters will enter to the right of the period.

Perhaps the best feature of the format setting procedure of MultiMate is that the formats remain with the document, just as in a dedicated word processor. Each time you call up a document, it will have the format assignments you last gave that job.

A Speed Demon

MultiMate really zips along. The relationship between keyboard and screen in writing new copy is as fast as any program.

Figure 4: Explanation of procedure for indenting text with MultiMate

This paragraph was begun by typing the tab key, which brought the cursor in five spaces from the left margin. Each succeeding line returns to the original margin, as would be desirable in ordinary copy.

This paragraph was begun by typing the indent key. The cursor moved the same five spaces in, but each line that followed also began at column number five.

This paragraph was begun with an indent and then a tab. The result is an indented block of copy with an ordinary paragraph offset of five spaces.

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seen; I was not able to get ahead of the cursor at any time in ordinary writing tasks. The keyboard lagged slightly behind the screen only when I was typing a copy on the screen or in the centering process.

According to Software Systems, MultiMate gains speed in three ways. First, the program is written in assembly language. Second, MultiMate uses its own programming for screen input and output operations, bypassing the PC-DOS BIOS (ASIC Input-Output System). Whether you'll notice the speed from fingertips to screen depends upon how fast you type. Third, occasional bursts of coordination can run well ahead of WordStar and other software that go through DOS.

One thing you will notice is the fact that pages of copy scrolled from the disk merely leap onto the screen, rather than being "pointed" line by line from the top. This is again due to MultiMate's bypass of DOS.

The third source of the program's speed derives from its "page" structure. For example, when it's time to exit the program, only the last page need be stored onto the disk, since each page is saved automatically as it is completed. I ran a quick and informal speed test, comparing MultiMate and WordStar 3.20 retrieving a 20-page document from disk, moving from page 1 to the end and saving the document on disk after typing.

	RETRIEVE	MOVE	SAVE
MultiMate	5 sec.	3 sec.	3 sec.
WordStar	5 sec.	9 sec.	22 sec.

Editing

MultiMate makes full use of the cursor board of the IBM PC, including the cursor arrows. The PgUp key serves the purpose as a "Previous Screen" key in a word processing machine, allowing you to see the previous 18 lines of copy. It works the other way. The Home key brings the cursor to the first character or symbol in the top left corner of the current screen; the End key does the opposite.

Other choices are offered with the use of the Ctrl key: Ctrl-Home brings the cursor to the first character of the current page; Ctrl-Pg-Up is a "Previous Page" command, while Ctrl-Pg-Dn brings the cursor to the first character of the next page. Alt F3 brings the cursor to the start

of whatever line it's in; Alt F4 brings it to the end of the line.

MultiMate's Delete and Insert functions are very quick, but quite different from the systems used by some other word processing programs. In ordinary typing, whatever is typed on the keyboard will be entered on the screen at the cursor position; if you back the cursor up using the arrows or any of the other positioning commands, whatever you type will overwrite copy on the screen.

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search for IB, you
would get IBM, ibis,
and Ibsen.***

In order to insert, you move the cursor to the point where the new copy is to begin and press the Ins key on the numeric keypad. A high-intensity message, "INSERT MODE," appears in the upper right corner of the screen, and all copy to the right and below the cursor disappears from the screen. "Don't worry," the instructions promise, "every time the Insert function is used, all the text you have previously typed is saved in the computer's memory buffer and will return when you complete the Insert function." While in Insert mode, you can move the cursor within the block of new copy to make changes. When the insert is completed, another press of the Ins key brings back the rest of the copy following the insert.

The instruction manual is correct; the function works as advertised. At times, however, it impedes the writing process to have to remember the next phrase on the screen. I found myself going in and out of Insert mode when I had to make a lengthy introduction to copy that would follow.

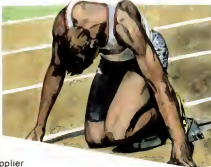
The Delete function, too, is different from most systems. However, I have no complaints about it.

To delete copy, you bring the cursor to the start of whatever block of copy is to be changed. Type "Del" from the numeric keypad ("DELETE MODE" appears in the top right corner) and the character above the cursor appears in bright type on the

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ordinary page, a beep sounds and the line number indicator at the top of the screen blinks in inverse. This is designed to notify the user to end the page by typing the F2 key.

The program has a functional reparation command, which allows you to go back and rearrange the pages to meet them even before printing. A message on the screen asks how many lines should be on each page. This was an area where the pre-release version had some recurring bugs, but the company claims the problem has been resolved.

There is no user control over "widows and orphans;" the program automatically rearranges copy so that a page does not end with the first line of a paragraph begin with the last line. Pages that look unpleasant can be changed manually.

MultiMate will justify the right margin of copy and generate microspacing commands for printers that can accommodate that function. But since the program does not include an automatic hyphenation function, and since the right-justification command is part of the printing function and not the editing mode, the only way to see the appearance of justified copy is to do a printout.

***T**HERE ARE A
few shortcomings in
the area of
maintenance of a
directory of files.*

The program also does not allow the user to disable the word wrap feature. There are commands to insert hard spaces (spaces that are considered part of a word and will not be split at the end of a line) and mandatory or optional hyphens.

MultiMate's "Search and Replace" function has its idiosyncrasias, too. It works only from the position of the cursor to the end of file; it ignores case. If you search for IB you would get IBM, ibis a lben; it will search for a string as long as 47 characters, but not if the sentence phrase is split over two pages. And finally, the search will not work if you initiate it at the last cursor position on the page.

can only be started from somewhere within the page.

File Management

The program appears to be well guarded against crashes. The only problems I encountered were several instances of fatal crashes in the first of two pre-release versions I tested, but the company says each problem has been fixed.

Because of the automatic disk updating at the end of each page, you risk losing only the current page if there is a crash. The program allows you to save the current page without exiting the program as the safeguard against loss.

The program will include a utility called "RECOVERY.EXE," which is designed to reconstruct any documents that have their directory or page table entries damaged. This utility—not tested for this review—generates a full screen or printed report of record allocation, record pointers, and other data required by the program to work its way through a file.

There are a few shortcomings in the area of maintenance of a directory of files. There is no indication of the size of a particular file stored on a MultiMate disk. The directory page will only state that space equivalent to an approximate number of pages remains on the document disk.

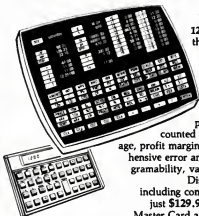
The process of naming a file is also limited. Although the program allows a user to give a file a name as long as 20 characters, the directory only pays attention to the first eight characters or num-

THE SAVING grace is the user's ability to set customized defaults for every element.

ers. Than again, it is not really necessary to have that much information in the file name when you can use MultiMate's directory search function to look for keywords in the document summary screen.

MultiMate allows for copying or removing of files, with transfers from disk

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to disk made as simple as specifying the disk letter. Files can also be deleted from within the program. There is no "Are you sure?" question before a deletion is accomplished, though. One other feature not present is a word counting utility. This device is of great value to professional writers, students, and others who are asked to provide a document of a particular length.

Softword promises to include in coming updates a file conversion utility, which will allow conversion of ASCII or DIF files to word processing files, or vice versa. This should allow editing and use of VisiCalc or similar files under MultiMate.

Also due is a utility to allow duplication of an entire disk from within the program.

Printing

Don't panic the first time you see the printing submission screen of MultiMate! How else do you expect the program to control all of its functions?

The saving grace is the user's ability to set customized defaults for every element. In many instances there is no need to change any entry on the forbidding-looking format page.

The submission screen has 19 different choices: These include page number to start end stop printing, the initial value of the page number for headers or footers, and the option of pausing between pages to allow insertion of single sheets of paper.

THE PROGRAM
*allows printing to go
on in the background,
leaving the computer
free for most other
tasks.*

The more unusual features of the print screen include:

- A Print Delay mode, which tells the computer to wait to print a document until a particular time or even a particular day. This feature would be of value in situations where a large office might share a

single printer; the user is, in effect, setting the priority for printing a particular document. The queue will be maintained as long as the MultiMate program is resident and the computer power is maintained. Skipping over the on-screen prompt tells the computer to print the document immediately.

- The option to have the document summary page printed as the lead item of a job.

- The ability to call for a printout of documents awaiting their turn in the printing queue, and the ability to order the computer to print in background or foreground.

- Assignment of a job to one of three different printers hooked up to your system.

- Selection of right justification and proportional spacing.

- The choice of draft print or emphasized print and ordinary size letters or expanded or compressed fonts as default assignments. Commands in the body of the document will override the defaults as necessary.

- Selection of a printer type.

As mentioned, the program allows printing to go on in the background, leaving the computer free for most other tasks. Once a document is sent to the printing queue, the program is freed up for operation of a new file or for editing any existing file except for the one being printed. It is also possible to assign a whole list of printing jobs to the queue; a print spooling utility allows you to shift around the order of jobs, cancel some or put others on hold. The background printing does speed down some of the operations of the program, and the printer will pause when some commands are sent in the foreground editing.

The program lacks a command that will halt printing of the current document; the only way to do so is to exit the program to DOS, which also wipes clean the print spooling list.

Merging

MultiMate includes two special merging functions: a utility that allows insertion of specific elements into form letters and a library function that allows the use of a standard file of phrases, sentences and paragraphs.

The library function would be of particular use in an office—such as the

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insurance company that requested it—where letters and documents often make reference to recurring blocks of copy. A typist could have a whole series of library files in storage containing passages of legal “boilerplate” contract provisions or product descriptions. The library could also include standard openings and closings for business correspondence.

There is no limit to the number of library files that can be created, but only one at a time can be “attached” to a current document for reference. Once the computer is told the name of the library file, the user can insert phrases or whole pages of copy with as few as three keystrokes: one to the F5 key, one to three characters to identify the name of the entry within the file, and the Return key. The insertion is almost instant.

MultiMote’s mailing merge function, on the other hand, is not quite so exciting or simple, mostly in comparison to the speed and ease of the program’s other commands. It works but the mail merge element of MultiMote is not its most spectacular selling point.

Learning the Rules

It is very rare in the still-evolving world of computers to find a highly capable program accompanied by a set of instructions mere mortals can understand. MultiMote is one of those rarities.

**IT IS VERY
rare in the still
evolving world of
computers to find a
highly capable
program accompanied
by a set of
instructions mere
mortals can
understand.**

The manual is well-designed and presented, and generally well-written. It appears to cover most questions that a first-time or experienced computer user

might ask.

MultiMote earns an A+ for appearances. The manual comes in a slipcase like the IBM books, but the binder inside is of sturdier stock. The binder also converts to an easel, which allows you to place the manual upright next to the keyboard as you learn the program.

The pages are printed on heavy paper in larger than ordinary type. Instructions are set in block; examples of the screen output are printed in green.

The manual starts with a four-page training section that covers most of the functions of the program. Some of the language is a bit stiff, but still understandable.

The next section should provide a lesson to all software “documentation” designers. Each function of the program is given a full page to itself, with the page divided between step-by-step instructions

MULTIMATE
*is an impressive
entrant in the word
processing market.*

and a column of helpful notes, as well as the description of how to go to the end of a page.

1. While holding down the Control key (Ctrl), press the End function key (End). Note: The cursor will move to the position immediately following the last character or symbol on the current page.

The manual is also endowed with full table of contents and an index.

Also included in the instruction manual is a full set of self-adhesive, color-coded key tabs to place on the front or top of key caps. The colors—salmon and pale green—identify whether the special function requires depression of the Alt or Ctrl key. The manual gives instructions on how to pry off the key caps to put the stickers in place neatly.

As mentioned before, I found the stickers unnecessary, not to mention uncomfortable. I chose instead to take the well-prepared chart of key tops from the manual and mount it on a card that I placed directly above the monitor; once I had been using the program for a few days

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und there were not that many times when I needed help.

The other element of the instructional package of MultiMate is its on-line help messages. At any point in the writing or editing of a document, you can press the Shift and the F1 keys to look up the procedure for any function or command of the program (see Figure 3). There are 79 different sets of clear and concise instructions—each individually accessible—in the version of MultiMate I tested.

The Bottom Line

MultiMate stands head and shoulders above many if not most of the available word processing programs for the IBM PC. There are some rough spots that need to be sanded, and a few areas where a bit of redesign would be valuable—file management and justification among them—but the program is nonetheless an impressive entrant in the word processing market.

MULTIMATE

was designed specifically for the IBM PC.

MicroPro, the producer of WordStar, has argued that the assignment of special keys for special functions slows down such typists, who are used to keeping their fingers on home row. That is the justification given for WordStar's extensive use of Ctrl K, Q, O and P commands, and its use of dot commands for formatting and other functions. (Interestingly, ten commands were assigned to the function keys on the IBM PC version of WordStar in an un-ballyhooed concession to dedicated key fanciers.)

Softword's MultiMate has clearly gone in the other direction, making extensive use of all of the corners of the IBM PC's keyboard. I found it very easy to learn to use the commands, and did not feel I was losing speed. And I quickly appreciated the fact that MultiMate was designed specifically for the IBM PC; there is an obvious synthesis of the machine and the program.

Ironically, the next version of MultiMate will be adapted for the WANG word processor, bringing us full circle. /PC

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In mass storage, the trade-off has always been convenience for capacity. Two new cartridge Winchester systems offer a good dose of both.

Hard Disks Made Easy

Mass storage for the IBM Personal Computer has presented a tough choice between the convenience of floppy disk drives, the superior speed and capacity (and much higher cost) of Winchester hard disk drives. But a new alternative, the removable cartridge Winchester, provides a tantalizing combination of the best features of both older drive types with no new price penalty.

Along with the boost in benefits, however, comes a difficult decision: rather than just one new alternative, two systems with different, incompatible standards are becoming available. One is an evolutionary adaptation of 5¼-inch hard disks to a removable cartridge format. The other goes further; it features a 3.9-inch (100 millimeter) design that brings

fresh ideas to the concept of Winchester drives.

Either system can be a nearly perfect mass storage solution for the IBM-PC.

The two new units are very similar in what they offer: five megabytes of data or program storage, combined with the quick access times and data transfer rates of Winchesters (that means five megabits per second, or about a tenth the waiting time of floppies), and the convenience and versatility only possible with removable media.

Each of the two systems uses an aluminum-based hard disk protected by a

high-impact plastic cartridge. Both are built to plug directly into the PC or into a separate expansion chassis.

Before we consider the technical differences between the two systems, it may be useful to investigate the advantages and disadvantages of conventional mass storage systems.

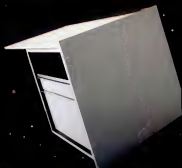
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er's city income tax withholding for the week of February 11, 1902. Its equivalents in the printed world are the libraries, telephone directories, filing cabinets, and ledgers. Traditionally, when storing large amounts of data, from personnel records to manuscripts of novels, there has been a trade-off between convenience, speed, and total memory capacity.

Until now three different types of memory have been popular: RAM, floppy disks, and Winchester hard disks. The best of all memories is solid state RAM,

THE MOST important difference between the two removable cartridge Winchester systems is cost.

RAM chips that store data completely electronically, either in flip-flops or on tiny capacitors. Because no mechanical motion is involved, data can move at nearly the speed of light, faster than any computer can operate. Consequently, the speed at which information can be retrieved is reduced by system operating requirements.

RAM is normally used for storing programs rather than holding permanent files because it is volatile. When the power is turned off, the memory is wiped clean. One wrong move and 3 months' work can evaporate into oblivion.

Obviously, keeping important data in RAM is not for the faint-hearted. Important files are usually distributed onto floppy disks or into hard disk drives to ensure that they will not be inadvertently lost.

On hard disk or floppy disk, data is stored as tiny permanent magnetic fields. These permanent magnets retain information whether the power is on or off. Disk memory is, therefore, nonvolatile. Files can be permanently stockpiled on disks without much worry.

Although each floppy disk holds only 40 to 320 kilobytes, the capacity of these standard memory systems is virtually unlimited. Run out of room on one disk,

pull it out and start filling up another.

But standard floppies have several major limitations. The amount of accessible memory on a single disk is relatively small. Perhaps this is no problem for small chores, but exceeding the capacity of a floppy can be frustrating and time consuming. And shifting essential information between disks can become tedious.

Besides, floppies are slow. Specific memory locations are found and read by a head at the end of a mechanical arm that must sweep across the disk. It takes time for the arm to start, stop, and settle down to read. In the microsecond world of the computer, such delays seem interminable and stretch out even simple jobs.

The speed at which data is read back into the computer is limited by the speed at which the disk rotates. Floppies spin at several hundred revolutions per minute (RPM)—300 RPM for 5¼-inch disks, 360 RPM for 8-inch disks—RPM for data transmission rates of around one million bits per second. This is slow compared to the speeds of most other memory systems.

The head of the floppy disk drive skims the disk during operation. The resulting friction slowly causes the disk to wear out and lose its ability to store magnetic fields without error. This is why floppy disks should be periodically replaced and why it is important to make frequent copies.

The conventional Winchester hard disk system gives users an increase in speed over floppies and greater on-line capacity, but at the cost of reduced convenience. Simply put, there's no way to load a Winchester except through a data port. This is like filling a milkshake through a straw.

The capacity of Winchesters available for the IBM PC can be as high as 20 megabytes, but disks inside the drives are not interchangeable. The only way to add more memory is to buy more disk drives—an expensive proposition. The Winchester reads data faster than a floppy disk drive because its hard disk spins about ten times faster, at 3600 RPM. Wear is not a problem because the head flies over the disk surface.

Backing Up data

Even with a nonvolatile memory sys-

tem like the Winchester, having all the memory always on-line is a mixed blessing. It can be changed or erased at any time. This is good when files need to be updated, but bad when the file is supposed to be permanent, like an inventory. A few misplaced keystrokes or a problem in the system can destroy valuable records in an instant.

Generally, hard disks should be backed up. Duplicate data should be stored in another location or on another medium to insure against problems. The cheapest backup is the floppy disk. Everything on a Winchester can be dumped onto floppies. But this is never very convenient; almost a hundred 5¼-inch floppy disks are needed to back up a 15 megabyte Winchester. Eight-inch floppies are better, but still inconvenient. Memory can only be transferred at the rate the slowest piece of hardware, the floppy disk drive, can accept it. It takes a long time to dump the entire contents of a Winchester onto a stack of floppy disks.

Another common backup for Winchesters is streaming tape. Although this is fast, the tape cartridges are expensive, and the system requires a drive used only for such backups. This is okay for those who can afford it, but may be prohibitive for the small system user.

The Cartridge Alternatives

It might appear that the convenience of removability and the huge capacity of hard disk storage are incompatible and that the features of floppies and Winches-

A REMOVABLE cartridge Winchester can even serve as its own backup.

ters could never be combined. The two new removable cartridge Winchester systems disprove this theory, but so did the first Winchester, which was introduced 8 years ago with removable disks. Winchesters became nonremovable only when they were re-engineered to make mass

storage affordable for the small system user.

The challenge of making removable cartridge Winchester units affordable is in creating the precision mechanism required for high density storage. The flying head of the Winchester drive system must stay within 12 to 18 thousandths of an inch of the disk surface—a fraction of a hair's breadth. A stray piece of dust or a smoke particle can crash into the head and ruin part of the disk.

In a conventional Winchester, the drive unit is sealed tightly inside an airtight chamber that keeps contamination out. Obviously, a sealed disk cannot be removable. The two new removable cartridge systems differ in their solutions to the contamination problem.

The 5¼-inch unit pressurizes the cartridge with recirculated filtered air to keep out foreign particles. Otherwise, the drive system is the same as an ordinary Winchester; and it uses the same size disk and the same magnetic coating on the disk surface.

The 3.9-inch disk employs a com-

pletely different solution. Instead of being coated, its surface is plated with a magnetic substance a thousand times harder than the traditional Winchester coating and harder than most contaminants. It therefore resists damage, including head crashes. Instead of using a

WINCHESTER cartridges can make an entire data base transportable.

wet-process lubricant that may trap dust, the Winchester used a dry graphite lubricant that also seals and protects the disk surface.

Because the 3.9-inch drive uses a smaller head positioning mechanism, its head can travel from track to track faster, which means that data access time with the smaller drive can be

somewhat faster. The drive units now available for the two systems differ significantly in size. The 5¼-inch drive is the same size as a standard minifloppy unit; the 3.9-inch drive is only half as high.

However, this difference is not significant. The first 5¼-inch drive available, the Genie 5X, slides directly into the B drive slot of the IBM PC chassis. The first 3.9-inch unit, from Tecma, has been adapted so that it, too, slides directly into the B slot. Other models of both systems are available mounted in an auxiliary chassis with optional traditional Winchester drives.

The smaller drive has an edge when mounted in the IBM PC chassis. Its power consumption, 15 watts, is roughly half that of a conventional Winchester. This means that heat build-up is not a problem, and the PC power supply has no trouble running it.

Although one company offering the 5¼-inch system selected it because of confidence in its design, most suppliers are confident that the 3.9-inch sys-

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Figure 1: A comparison of two removable cartridge Winchester. Specifications are from the manufacturers' data sheets.

	3.9-inch (Tecmar)	5.25-inch (Genie)
Capacity, unformatted	6.38 megabytes	6.38 megabytes
formatted	5.0 megabytes	5.0 megabytes
Recording format		
recording density	12,000 bits per inch	9,022 bits per inch
track density	435 tracks per inch	345 tracks per inch
surfaces	2	2
rotational rate	3547 rpm	3600 rpm
Interface	(Both units are compatible with most existing 5¼-inch hard disk controllers)	
Data rate	5.0 megabits per second	5.0 megabits per second
Access time, track to track	3.0 milliseconds	3.0 milliseconds
Average latency	8.33 milliseconds	8.33 milliseconds
Error rate		
hard errors	1 in 10 ¹² bits read	1 in 10 ¹² bits read
soft errors	1 in 10 ⁹ bits read	1 in 10 ¹⁰ bits read
seek errors	1 in 10 ⁶ seeks	1 in 10 ⁶ seeks
Disk size, diameter	3.9 inches (100 mm.)	5.25 inches
Cartridge size	4.41 × 4.33 × .43 inches	5.551 × 5.394 × .748 inches
	112 × 110 × 11 millimeters	141 × 137 × 19 millimeters
Cartridge weight	5 ounces	11 ounces
Reliability		
Mean Time Between Failures (MTBF)	11,000 power-on hours (POH)	11,000 POH
Mean Time To Repair (MTTR)	30 minutes	30 minutes
Design life	5 years	5 years
Standard	"de facto"	proposed ANSI X3B7/1981-54
Price		
drive with support for installation in IBM-PC cartridge	\$1,795 \$90	\$2,295 \$119

tem can more than hold its own. "We wouldn't offer a two-year warranty with it if we didn't think it would stand up," said Sandy Schupper, president of Micro-Disk.

Perhaps the biggest concern with any new system is standardization. A system with a single supplier can run into trouble if that sole supplier stops offering the unit or goes out of business. The 3.9-inch removable cartridge Winchester was developed by SyQuest Technologies in Fremont, California, which claims it has become a de facto standard. A second source, Computer Communication Technologies (CCT) Corporation, has been announced, and a license is being negotiated with an undisclosed foreign firm for the manufacture of drive and media, according to SyQuest. The company also notes that over a dozen suppliers of peripherals for the IBM PC will offer the 3.9-inch drive units. These manufacturers in-

clude Tecmar, Santa Clara Systems, X-Comp, Micro-Disk, Quality Computer Services, Davong, VR Data, and All Systems Go.

A REMOVABLE cartridge Winchester system is more than a disk drive.

The 5¼-inch removable cartridge Winchester system is a proposed American National Standards Institute (ANSI) industry standard, and is being made or considered by established firms like Dysan, Seagate, and Memorex.

(One note regarding compatibility: some IBM PC peripheral suppliers use

different disk controllers with different protocols and different data formats of their removable cartridge Winchester disks. Consequently, disks written on the drive of one cartridge Winchester supplier may not be readable on a drive unit offered by another supplier—even if they use the same size disks. This problem also occurs with floppies.

Probably the most important difference between the two removable cartridge Winchester systems—and the factor that may determine which becomes more widely accepted—is cost. The Tecmar 3.9-inch removable cartridge Winchester unit designed to mount directly into the PC chassis lists for \$1,795, and cartridges for it currently cost \$90. List price quoted for the Genie X5 5¼-inch removable cartridge Winchester drive unit also designed to plug directly into the IBM PC chassis is \$2,295. Cartridges for it cost \$119. Both

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units store 5 megabytes of data on each cartridge. Other units using the two systems are priced similarly.

Uses for Removable Cartridges

Either removable cartridge Winchester is an excellent choice to back up conventional Winchester drives. An entire five megabyte disk can be safely copied onto one cartridge in seconds. No one need worry that the literary world will collapse because a novel-to-be was dispatched to never-never land by an errant keystroke.

A removable cartridge Winchester can be used as a primary mass storage system in lieu of a conventional Winchester and can even serve as its own backup. The same data can be written onto two disks: one that stays in the drive and another that is in protective storage.

System data storage capacity with a removable cartridge Winchester is just as unlimited as with floppies—if more space is needed, another cartridge is pushed into the drive. And each cartridge provides a much more sizeable slice of storage than even the biggest floppy.

Like floppy disks, Winchester cartridges can be used to keep files secure. Instead of being locked forever inside the drive unit and consequently subject to unauthorized access and tampering, the removable media can be put in a safe place: a locked cabinet, a safe, or even hidden away in a mattress.

Winchester cartridges can make an entire data base transportable. The Winchester cartridge can be taken to branch offices or the beach, sent to other users (who use the same manufacturer's drive) by mail, or dispatched by dog sled to the Yukon.

The cartridge can also be used for storing bulky collections of information and software. Instead of putting the array and disarray of paper files into a seething mass of floppies that can become almost as disorganized, everything can be kept in a single convenient cartridge.

Typical applications include data base management and archival storage. Data base management is one of those wonderful terms in computers that could mean just about anything. Fortunately, the removable cartridge Winchester can do just about everything, so the two go hand-in-hand.

Data base management requires that

extensive information—the words of a manuscript, an insurance company's client files or a dentist's patient records, for instance—be safely kept while at the same time it is readily accessible for updating or reorganization. A novelist might make revisions to his book or a dentist may extract a tooth (both about equally painful) and the updated data is

***E**ITHER SYSTEM can be a nearly perfect mass storage solution for the IBM PC.*

instantly transmitted into the system.

Although a huge amount of mass storage is not always necessary for data base management, hard disk drives begin to make sense when files become large and cumbersome. The removable cartridge Winchester allows storage and updating for up to five megabytes of information (enough for the largest novels) as well as the security of being able to lock up the data for the sake of posterity or the Internal Revenue Service.

The ability to hold an unlimited amount of data and keep it secure also makes the removable cartridge Winchester a good choice for storing archives. The cartridge medium itself is extremely compact—it stores data even more densely than microfilm.

Other Considerations

Because all of the 3.5-inch drives currently originate at one factory, the drives themselves will be identical no matter what name is on the front. The situation for 5¼-inch drives is similar.

But a removable cartridge Winchester system is more than a disk drive. System support, which includes the basic hardware, the disk controller, interface hardware and software, must all be considered when making a purchase decision.

Although most units are configured differently, the Tecmar system is an example of what to expect. Besides the drive itself, the user receives one car-

tridge, the necessary interface hardware, software, cabling, mounting hardware, understandable instructions, and complete documentation. The thick users' manual gives instructions that are clear enough so that anyone who can follow a recipe can probably install the whole system in 10 to 30 minutes. The only mechanical task is snaking cables properly through the PC chassis.

Tecmar provides a controller with Direct Memory Access (DMA); its internal circuits relieve the system's central processing unit of memory management worries so data can be transferred off the disk end into the PC as fast as the computer can handle it, three times faster than Tecmar's previous controller.

Software provided with the Tecmar removable cartridge Winchester includes an installation program that modifies IBM's operating system to make use of the increased memory; it allows up to four PCs to share one drive unit, allows the PC user to assign any designation letter to any drive (so drive A could be the removable cartridge Winchester, for instance), and allows any physical disk drive to appear as up to eight "logical" drives to the computer. Over a dozen utilities are also provided, including several to speed up backups, an enhanced directory utility, and special formatting.

Cartridge Winchester disks should become popular with users who need to store mountains of files or data in a secure, transportable way. The only alternative at present is to fill up tall stacks of floppies and then shuffle through them when hunting for particular information. Cartridges are perfect as backups for conventional Winchester disks. However, with so many removable cartridge systems due on the market, users may want to wait until competition drives down the price and determines which of the two existing formats will become standard. /PC

Winn L. Rosch is a free-lance writer who regularly contributes features on consumer electronics to the Cleveland Plain Dealer. He is news editor of *The Electron*, published by the Cleveland Institute of Electronics.

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For only \$95.00, you can also get the HP 17057 Overhead Transparency Kit that produces plots on transparencies for overhead projectors. For "I need it tomorrow at 9:00 A.M." meetings, it's a necessity.

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1101301



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11301-PM3

Here are ways to use a PC that will put you in business—especially at tax time.

Making Tax Write-Offs Your Business



so many hard-working people find in tough economic times, you should no doubt like to earn more money. But you may not realize it is that the costs of operating a second business are deductible if you go about it properly. Perhaps the best fringe benefit of operating a sideline business is the large tax loss can offset the wages from your primary job. The net effect is a larger tax refund, as well as additional tax sheltered income. The good news is that the existing tax laws seem to favor computers as deductions.

If you generate losses in your sideline business year after year, Internal Revenue will attack your deductions by claiming it was not a business entered into for profit, but simply your hobby, and that your expenses are not deductible. So the IRS has settled the issue by coming up with an arbitrary number of years that a company can declare a loss. If, for tax purposes, you show a net profit from your business in any two out of five consecutive years, then the venture is presumed to be "one entered into for profit" and the resulting losses are deductible. (One way of forcing that desired outcome is by allocating all income in one year and all deductible expenses into the next.)

Looking Like a Business

If you can indeed show that you are running a genuine attempt at earning a profit, Internal Revenue can't bother you, even if you show consistent losses. So the attempt to generate profit is as important as whether you actually earn one.

Say you have a lot of money tied up in your system, and you have become quite proficient at writing programs. So confident that friends and neighbors

begin asking computer-related questions, like how to use a computer in their business or on simple programming tips. Let's also say that a businessman-friend may be willing to pay you for that computer advice and that any new owner would be willing to pay a consulting fee to someone like yourself for setting up his system.

Now to breathe life into your consulting business. You will need a name. How about John Doe, Computer Consultant? Nothing fancy, just the basics. Next go to your bank and open a separate business checking account under the new name. In most cases, you won't need a business license; if you do, the license will be tax deductible and lends further authenticity to your claim that the business is one entered into for profit. Now transfer a few hundred dollars into the account to get it started. Next, go to your nearest instant printer and have some letterhead stationery, invoices, and business cards printed up. . . . They are all tax deductible.

You could change your telephone to a business listing and pay for an ad in the yellow pages. This starts to get expensive, however, so hold off for now. If your computer is not insured, go out and buy a policy. If the computer is deductible, so are the insurance premiums. Start thinking like a businessman.

Profit Is the Key

Above all else, you must try to generate a profit. Pass out your new business cards to friends and relatives. Drop in on small businesses in your neighborhood and talk computers. Run a small, deductible, classified ad in the local paper geared to helping other PC users. Leave a supply of business cards at your favorite computer stores. Someone out there needs help with computers and is willing to pay you for the advice.

If worse comes to worse, you could always bill your friends for consulting and they could do the same with you. If the consulting time was legit, so is the invoice. The only difference is that two computers can get written off . . . not just one since you are both in the computer consulting business.

Educational Write-Offs

But if you don't form your own business, don't despair. You may be able to justify your computer cost for educational

purposes. To qualify, you have to show that the use of the computer maintains or improves existing job skills required by your employer, even if the continuing education leads to a degree; or, that the use of the computer meets the express requirements of keeping your job (you can get a letter from your employer to back that up).

Whichever your course of action, establishing your computer as a sideline business or as an educational expense, you will need good records. Go out of your way to accumulate receipts. Buy an accordion file and keep an up-to-date diary showing exactly when and where you went to solicit new business—even trips to the computer store to buy floppy disks would be deductible at 20 cents per mile.

What To Tell the IRS

If you claim tax deductions for a business based around your PC, these are some questions you should be prepared to answer for the IRS.

1. Are you putting forth a lot of effort into the business on a consistent basis?

2. Are you even qualified to be in the business? For instance, if you don't even know how to program, how can you teach it to others?

3. How much income have you generated over the past year compared to the expenses you incurred? Over how many years have you claimed a profit?

4. The way you are going about things, can you ever repay the cost of your computer?

5. Do you attend the necessary workshops/seminars to keep up to date with changes in the field? Do you belong to the proper clubs and organizations that someone in the computer field would join?

6. Are you a paid up subscriber to computer journals?

7. Do you work a full time job? If so, when do you even have time to pursue the part-time business?

Six Characters in Search of a Write Off

These hypothetical situations illustrate six ways that using a PC in your present work or in a second business can pay off at tax time.

Computer Programmer

Get a letter from your employer stating you are experimenting with certain software applications that require your working after hours, and that you require your own computer for testing purposes.

Word Processor by Night

If you have a word processing program consider running a small ad in a local newspaper that you do typing/word processing. You may be amazed at the response. And if you have a business you operate during the day, consider a small accounting package to keep track of inventory or receivables, then your tax writeoff is a snap.

Teacher

Try to use your computer for tasks related to your field of teaching: i.e. notes, or bibliographies. Find some whiz kid studying computer sciences to write a simple program that will keep track of student names and grades.

Student

Say you are going for a degree and the folks surprised you with a computer to

help in your studies. First make sure that the bill is in your name. Then go and buy a word processing package and help students and faculty with their papers or with simple tasks. Better yet, consider renting out your computer to other students on an hourly basis.

Investor

Consider buying VisiCalc to cheat your investments. Or buy a modem and hook into the Dow Jones. The only problem is that you can not get the quick writeoff on the first \$5,000 as an investment expense and will have to prorate your computer deduction between investment and personal usage, but you still get a tax write-off.

Tax Preparer

You file a tax return, correct? Why not buy one of the Income tax programs for the PC and offer to do tax returns for your friends and neighbors, say for \$25 per return? This would accomplish a two-fold purpose. (a) provide a means by which you could recover the cost of the tax program and (b) put you in the income tax preparation business. —B.R.S.

supplies, paper, ribbons, typewriter, dues, subscriptions, manuals, advertising, utilities, telephone, attending computer trade shows (including transportation and hotel), business cards, stationery, printing, postage, use of your car at 20 cents per mile, parking, taxis, entertainment of prospective customers, plus the costs of a home office.

Writing Off a Home Office

Now that you have a profitable tax-deductible business, you will need a suitable location. How about writing off your spare bedroom?

According to the IRS, if you use your home as a place of business—even for a secondary business—you can get a write off if your home is the primary location of the business. Also, according to the IRS, you must use the space regularly and exclusively for business, or as a place to

meet with prospective clients or customers. Requiring a lot of space for a computer should make it easier to justify an extra room. While you should have a separate room for your home office, if space necessitates your using a corner of the bedroom, arrange your furniture in such a way as to create a separate work area within that room. The only problem is that the total of any home office deduction is limited to your income received

THE BEST fringe benefit of operating a sideline business is the large tax loss that can offset the wages from your primary job.

from the side-line business; a home office deduction cannot cause the business loss alone.

Summary

If you can convince the tax collector that you have a legitimate sideline business and need a computer, the following rewards can be substantial.

- Writing off the first \$5,000 cost of your computer immediately and the balance over 5 years with a 6% investment tax credit to boot.
- Deducting all travel expenses to attend computer shows and conferences regardless of where they may be held.
- Writing off the cost of any and all continuing education, magazines, dues, subscriptions and insurance premiums on your hardware.
- A deduction for the cost of printers, disc drives and all peripherals as well as software costs.
- Let Uncle Sam pay for the cost of your computer this year. It's all perfectly legal. /P

Barry R. Steiner is a Chicago-based Certified Public Accountant, a former Internal Revenue Agent, and author of the income tax guides *Pay Less Tax Legally* and *Perfectly Legal*.

8. Are you really trying to make a profit or simply trying to deduct a hobby loss?

Writing Off Your Computer

Because of a rather large loophole left in the new tax law, the first \$5,000 spent on equipment used in a trade or business—including, but not limited to, the cost of your computer hardware—is deductible all in one year. Included in the definition of business assets are printers, modems, desks, chairs, and even the cost of an automobile, if these are used for business purposes. Any excess spent over \$5,000 is subject to 5-year depreciation and a 6 percent investment tax credit. This expense is deductible under Section 179; a formal election must be filed with your tax return to qualify.

The other costs associated with your business are deductible as well, including

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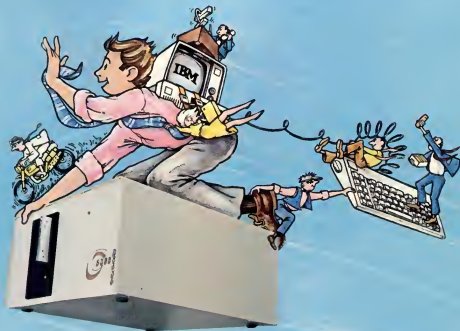
PROGRAM -- FILE MAINTENANCE -- 04-12-1982

FUNCTION: File Maintenance Entry
Report Title: (1) Report Records Per Page: (10)

File Name: FILEDEF

Field Name	Field Type	Length	Position
1. NAME	CHARACTER	30	1
2. ADDRESS 1	CHARACTER	30	31
3. ADDRESS 2	CHARACTER	30	61
4. CITY	CHARACTER	30	91
5. STATE	CHARACTER	30	121
6. ZIP CODE	CHARACTER	30	151
7. CUSTOMER CATEGORY	CHARACTER	30	181
8. NAME	CHARACTER	30	211
9. NAME 2	CHARACTER	30	241
10. NAME 3	CHARACTER	30	271
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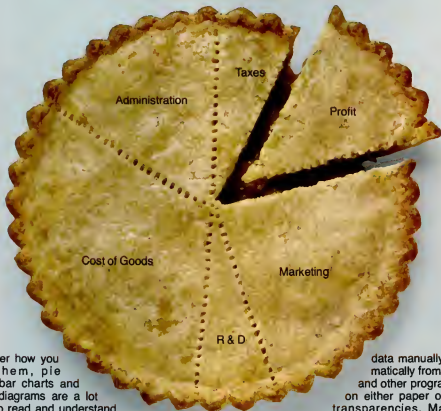
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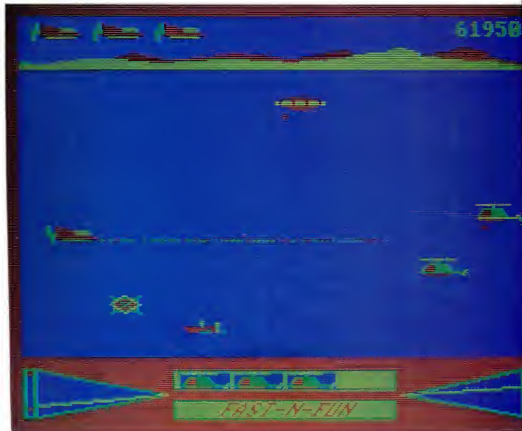
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CIRCLE 462 ON READER SERVICE CARD

the success of the leading spreadsheet program has generated a small industry of compatible support products. These five are among the best.

Getting MORE Out Of VISICALC

The value of VisiCalc has been proven by its popularity. This program has defined personal computing for tens of thousands of users. VisiCalc is good, but many of us cannot resist the temptation to make it do something just a little bit better. This article suggests several ways to do this. The best suggestion is to get hold of a comprehensive, well-edited guide to VisiCalc.

Before you try to improve on the original, you need to understand the features of VisiCalc designers Dan Bricklin and Bob Frankston incorporated in the program. Many books are available on the subject, and while they are all generally useful, most fell short for one reason or another. First, the program can be made

easier to use through the use of prepared templates providing standard formats for common VisiCalc tasks. Second, special programs can work on the VisiCalc files to accumulate and compile data contained in different spreadsheets and to present it in finished form. Finally, the data can be presented graphically, using either a plotter or a graphics printer. This review will examine a useful reference to VisiCalc, a utility program, and a complete graphics package and also discuss two ways of using prepared templates.

Supplement the Manual

Technical books are usually either good texts or good references. The Visi-

Calc Book for the IBM Personal Computer by Donald H. Beil is both. Published by the Reston Publishing division of Prentice-Hall, it is divided into 14 chapters that cover every aspect of the use of VisiCalc on the IBM PC. Chapters include an introduction, detailed examples of commands, end explanations of formulas and built-in functions. The book also includes a discussion of errors, the use of the system by nontechnical people, a summary of VisiCalc terms, an extensive annotated bibliography, a good index, and a set of practice problems.

A book of this kind begs the question, "What can I get from this book that I can't get from the instruction manual?" After

all, the VisiCalc manual for the IBM PC is reasonably good. It contains a tutorial, a description of commands, and a handy reference guide. The main difference between the book and the VisiCorp manual is style. The VisiCalc Book is easier to read and places more emphasis on explanations and examples. It gives an alternate and understandable explanation of a technical subject.

THE VISICALC Book provides an interesting investigation of a rewarding topic.

One way to compare both texts is to look at their explanation of the powerful but potentially confusing replicate com-

mand. Both books dedicate about 20 pages to this command. The manual's explanations focus on the commands to be entered and the results. The VisiCalc Book provides more detailed explanation of the application of alternatives under the replicate command.

In a more esoteric area, the book gives practical explanations of built-in functions such as ARCCOSINE and CHOOSE. Neither of these functions is treated in detail in the manual. In fact, as long as I relied solely on the manual, I was never able to understand how to use the CHOOSE function. The VisiCalc Book has helped clear up my confusion.

Additionally The VisiCalc Book provides practical hints on the creation of templates. It provides a checklist of 22 items that help the VisiCalc user build useful and practical templates. The information on error prevention and the exercises is also very useful.

Beil's text is extensively illustrated; nearly every page contains spreadsheet or command illustrations. The writing style

is light, and the author tries to participate with the reader in discovering the power of VisiCalc. As important, the information

THE VISICALC Book provides practical hints on the creation of templates.

tion is technically accurate.

The VisiCalc Book provides an interesting investigation of a rewarding topic. It deserves a place on the reference bookshelf of any VisiCalc user.

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VisiCalc users build spreadsheets based on their own needs and ideas. They enjoy tailoring my spreadsheets

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templates can be
useful because they
reduce the time and
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and I have been known to overlook some important factors. Once, when I itemized tax deductions, I forgot to subtract the standard deduction. The results were considerably different from what the IRS expected. While it is nice to roll your own

spreadsheets, there may be times when you prefer standard forms prepared by people with experience.

When you want to build your own spreadsheet, you can use a VisiCalc template or blank form. It has all the labels and formulas in place and only requires the entry of data. In practice, VisiCalc templates usually include sample data entries to demonstrate how the program works.

VisiCalc templates can be useful because they reduce the time and work needed to produce a spreadsheet or report. Further, they produce reports in standard formats. However, what you gain in standardization you lose in personalization. The analysis provided by standardized templates might not be exactly what you want. Customizing the analysis can force you to reverse-engineer the entire template, which can be as hard as designing it in the first place. Changing a prepared template must be done with care, because even a small incorrect change in the middle of a spreadsheet can

produce an invalid report. Finally, even experienced VisiCalc users can make errors when working with an unfamiliar spreadsheet. You have to take care to avoid overwriting a formula by entering data into a block that should show results. It can be very difficult to re-create a missing formula. Prepared templates provide advantages in standardization and completeness, but they have to be used carefully.

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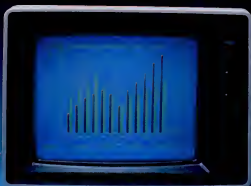
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that emphasizes computer topics, has released a handy book, that contains 50 VisiColc templates you can type in and use. The template models are divided into categories covering loans and investments, general business, inventory control, advertising and sales, personnel and accounting departments, personal finance, and household aids. Specific models provide a stock portfolio report, retail sales summary, payroll worksheet, net worth statement, and a quantity ordering guide for painting jobs.

Each model spreadsheet described in the book includes a listing of the commands needed to produce the sheet, and an example of how the finished screen or printed report should look. The listings are keyed in under VisiColc using the > (Go To) command to position the cursor. Each model also includes a functional explanation of what it is intended to do, but the explanations do not include technical details. You are expected to simply accept most of the accounting or statistical principles behind each template.

The models in the VisiColc Home and Office Companion are easy to understand and professionally designed, but entering the listings can become tedious. Some of them have several hundred lines and most of the lines contain formulas with numbers, signs, and multiple parentheses. VisiColc has some capability for detecting gross entry errors, but checking or troubleshooting a data sheet requires a

book and computer stores.

Templates on Disk

If you receive VisiColc templates on disk, you will be spared the task of keying the code into your machine. You may also avoid programming problems and the necessity of troubleshooting. Sofstar, Inc.

Product Information

For more information on the products mentioned in this article, consult the following list of manufacturers.

The VisiColc Book for the IBM
Personal Computer
Donald H. Beil
Reston Publishing Company, Inc.
A Prentice-Hall Company
Englewood Cliffs, NJ 07632
335 pages; \$15.98

VisiColc Home and Office
Companion
David M. Castlewitz and Lawrence J.
Chisasky
OSBORNE/McGraw Hill
630 Bencroft Way
Berkeley, CA 94710
181 pages; \$15.99

VisiColc Reol Estate Templates
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has developed a program package called VisiColc Reol Estate Templates. It provides a very sophisticated analysis of various aspects of personal and real estate investments.

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*has the ability to
"remember" the steps
it went through to
collect the data and to
repeat or modify the
process as needed.*

The Sofstar Reol Estate Template comes on two full disks that can be copied for back-up protection. The spreadsheet models on each disk are nicely integrated into VisiColc through a special menu system. A master menu is presented for each disk, and the various models are loaded and overlaid through the use of VisiColc commands. Once you enter your own data into a template, it can be saved to working disk like any other VisiColc spreadsheet.

A strong feature of this package is its ability to put your financial and investment information in the form needed by real estate agents and lending institutions. The personal financial statement uses a great deal of data and presents it so that it can be clearly understood by the loan officer of a financial institution. Providing complete and easily understood financial data can help you qualify for loans. Even if you aren't trying to get a loan, this is an interesting report to run periodically on your own financial health. Preparing a complete personal financial statement is a good way to check your economic health.

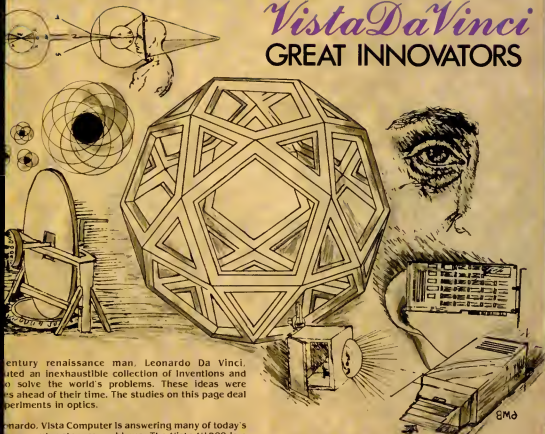
Other templates in the Sofstar package serve as useful analysis tools. One template displays the payments on a loan and the amount going to principles and interest on a monthly basis. Other templates display depreciation schedules for investment property using various methods, including the most recently introduced accelerated cost recovery system (ACRS). The ACRS templates can help

CHECKING OR troubleshooting a data sheet requires a great deal of proofreading.

great deal of proofreading. The investment in time may partially offset the relatively low cost-per-model advantage gained by buying the listings in a book instead of receiving them on disk.

The Home and Office Companion is a good investment if you need even a few of the 50 VisiColc models it contains and if you have the patience and time to key them in. This book is available at both

VistaDaVinci GREAT INNOVATORS



century renaissance man, Leonardo Da Vinci, created an inexhaustible collection of inventions and to solve the world's problems. These ideas were years ahead of their time. The studies on this page deal with experiments in optics.

Leonardo, Vista Computer is answering many of today's computer storage problems. The Vista V1200 is a solution to IBMPC storage. Mass storage for your IBMPC system has always been a problem. On one hand, there are exotic, expensive hard disks with no cost efficient way of backup. On the other hand, the IBMPC floppy drive is slow. The speed and storage demanded by today's applications.

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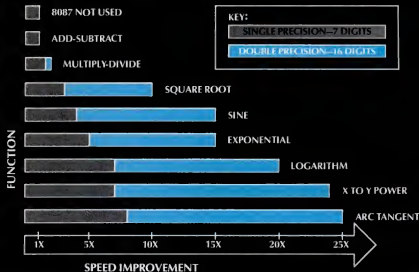
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to determine if the accelerated or straight line methods of figuring depreciation will benefit you the most.

If you own rental property as an investment, you will probably be interested in the template that provides income property investment analysis. I have owned rental property for several years and thought I understood the flow of capital and investment return, but this model produced me to some very significant errors I had overlooked. These templates made setting up the analysis in VisiCalc easy, but it took some work to gather all of the data asked for in the model.

The income property investment analysis model asks for the data you would expect to provide, such as the building cost at acquisition and the cost of land, and cost, however, is specified in dollars per square foot, while land size is requested in acres. I had to do some math on the side to get these figures in the right form.)

The model also asks for a capitalization rate for the property. This is a concept that describes the rate of return an investor should expect on his investment, as a sum computed to return the amount of the investment during the life of the property. This rate is strongly influenced by local housing market condi-

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understood financial
data can help you
qualify for loans.*

I had to contact a local banker to determine a reasonable capitalization rate for the area my property is in, but this still mounts to little more than an educated guess.

The investment analysis spreadsheet can account for balloon payments, but it cannot handle a variable interest rate loan. This may limit the quality of your analysis if you bought your property under a floating or increasing mortgage rate.

The Sofstar program package is well-documented and provides explanations

of the installation procedures, the program's operation, accounting principles, and terms used in the text. The manual is easy to read and understand and includes examples of each model.

Adding a Third Dimension

As useful as a spreadsheet program like VisiCalc is, there are still some things that are easier to do on paper.

If VisiCalc is used to keep a cumulative record of information that grows at a regular rate, the information will either outgrow the spreadsheet, or the spreadsheet will take so long to recalculate that it becomes tedious. The solution is to break the data into smaller sections such as monthly or category reports. But many of us have found ourselves writing the totals from these separate reports down on the back of an envelope so they could be added to give a current total... hardly an adequate use of computing power.

Abacus Associates has released a program called VIZ.A.CON that provides the ability to accumulate and manipulate data contained in many identical VisiCalc spreadsheets. The company refers to this as "adding a third dimension" to the VisiCalc models. VIZ.A.CON allows you to combine data from multiple reports into a single form; convert weekly sales reports into monthly, quarterly, and yearly reports; and project department budget data into division, region, and corporate reports.

VIZ.A.CON has the ability to "remember" the steps it went through to collect the data and to repeat or modify the process as needed. The program asks an extensive set of questions to establish the names and sequence of files it must examine to collect data. The process steps can be saved to a file at any time, and additional steps can be added and saved under a different file name. This feature allows you to make partial or interim reports from specific VisiCalc spreadsheets.

VIZ.A.CON takes the data it uses from VisiCalc .DIF files. All files used in the consolidation must have the same number of rows and columns. In practice, you use VisiCalc to build the format once and then save the format under the different names you will assign to the spreadsheets to be consolidated. The same format is used in the final report. VIZ.A.CON sums up the data contained in each specific

position on all of the spreadsheets it examines. The end product is a VisiCalc .DIF file that can either be used by VIZ.A.CON for further consolidation or by VisiCalc for further calculation.

Both VIZ.A.CON or VisiCalc can print a table containing the consolidated re-

THERE IS NO
installation associated
with the VIZ.A.CON
program.

sults. I found it was easier to print the consolidated file using VisiCalc because I could modify the element names, perform additional statistical work—the ratios of two data elements, for example—and because VisiCalc was faster.

Plan ahead if you are going to construct spreadsheets for consolidation under VIZ.A.CON. First, you must carefully prepare an empty form for the program to write into and also prepare your spreadsheet subdivisions to allow the kind of reporting you need. Abacus Associates has helped the planning process by providing a checklist and layout form in the program manual. This allows you to plan consolidation steps in advance and to record the several process names, file names, and higher level group names that might be involved in the preparation and printing of a report.

There is no installation associated with the VIZ.A.CON program, and its question format makes it easy to use. The program is written in BASIC, but it comes with the BASIC interpreter on disk and is ready to boot up and run. The entire disk can be copied for a back-up. The question format is effective and includes different levels of automatic help if incorrect answers are entered. I was a little confused initially because the Y or N responses have to be in uppercase. Since some questions can be bypassed, the program interpreted my lower case y as a carriage return and moved on to the next question. I knew the questions I was seeing on the screen did not match what the manual said should be happening, but the manual made no mention of the need for

uppercase entries.

There are several problems with the manual. It contains good examples and reasonably good explanations of the program functions, but the text is disjointed. The overview of the program appears in the third section instead of the front of the manual. I had to hunt through the manual to find the name of the batch file (DOVCON.BAT) that starts the program. There is no index, and the valuable helpful hints to the VIZ.A.CON features are in an appendix where they might be overlooked. A simple reorganization of the material in the manual would increase its value.

VIZ.A.CON empowers the power of VisiCalc, allowing you to break your data into easily handled pieces. The program is available for many different microcomputers, including the IBM PC.

Chartman

The human eye is a broad path into the mind. People understand concepts and comparisons more quickly and complete-

ly when they are presented graphically rather than when they are described in words. The versatile VisiCalc spreadsheet assimilates a great deal of data, but

CHARTMAN IS a program that allows you to display VisiCalc data in graphic form.

the columns and rows can quickly become boring and repetitive. When this happens, the comparisons made only by numbers can be difficult to grasp. Chartman, a program that allows you to display VisiCalc data in graphic form, overcomes the limitations of standard table formats. It enhances the presentation of data and is consequently very valuable to the business user. I would much rather describe

business concepts and trends to my boss with a few charts than with pages of spreadsheets.

Chartman is actually a family of software packages, distributed by Graph Software in Boston, Massachusetts. Chartman I and Chartman II are very similar; both can convert either VisiCalc data or other, easily-entered data into multiple color charts and graphs.

Chartman I requires a PC equipped with a color graphics adapter card, but it displays itself will be monochrome. Chartman II provides high resolution color when used with the IBM graphics card and color monitor. Chartman III is a simpler program that generates fewer types of charts, all of them displayed on the screen in monochrome graphics. The following descriptions hold true for Chartman I and II, but not always for Chartman III.

The Chartman family produces illustrations using the Hewlett-Packard 7470 two pen plotter, the Hewlett-Packard 7220 eight pen plotter, or the Epson MX-80 or MX-100 printers with the Gray

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Circle 30 on Reader Service Card

Trax option. Minimum PC configuration requirements are RAM and PC DOS 1.1. Chartman II also prints color charts on the IDS Prism color printers and can interface with an IBM XY-750 plotter. If you want to display the chart on screen, you will also need the IBM Color Graphics Adapter in your PC.

Chartman comes on three disks, each with an excellent installation and copy program. The operating system and BASICA are automatically transferred to the Chartman disks when you install the program. The copy program makes working copies of the software. All you have to do is to move disks in and out of the drives in response to the very clear directions.

Chartman's easy-to-use and effective installation program is typical of the entire package. You can design the charts you need quickly by using the menus, which are presented on the screen as reverse video boxes with logical choices in each box. The menu and program commands make good use of the special function keys on the IBM PC. Once you select

the kind of chart you want (bar, pie, or graph) and insert the proper disk, the program leads you through the design steps very quickly. You do not have to plot coordinates or make any irrevocable deci-

CHARTMAN's
*easy-to-use and
effective installation
program is typical of
the entire package.*

sions about units of measure. You can put any kind of text—titles, item names, units on the x- and y-axes, footnotes—on the chart.

Chartman is a stand-alone package. You can have the full capabilities of the program without using VisiCalc. The data

may be entered directly into the Chartman format from the keyboard or from a prepared file. The program does, however, have the ability to read and use data from a VisiCalc .DIF file.

Chartman is a valuable addition to VisiCalc because it lends flexibility and visibility to your data. You can create line, pie, or bar chart from the data transferred from VisiCalc. You can transfer your data; create a chart with labels, titles and footnotes; and read in a different set of VisiCalc derived numbers while retaining labels and other characters. You can also save each final chart with all of the labels and data in a separate file for later use.

To convert VisiCalc data to graphics with Chartman, you have to save the numbers and titles you want by using the VisiCalc .DIF file format. This is not difficult, but you have to plan exactly what data you want on your chart. You can use up to 4 VisiCalc columns of numbers for a Chartman bar chart and up to seven columns for a line chart. The data in each of the

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columns on the bar chart can be used to make small bars in a cluster of six large bars or stacked blocks in six large bars. In the line chart, the first column is the x-axis and the other six columns will be the y-axis values for each plotted line. Pie charts have more limited display capabilities because there are only so many ways to slice a pie.

Printers, Plotters, Slide Shows

Chartman displays charts and graphs three ways. It can send them to a printer, it can plot them, or it can display them on a screen. Each of these methods has unique applications.

The Chartmon output to a printer is fast. The fastest product is a compressed (half page) chart. This takes about 90 seconds to produce on the IBM PC (Epson) printer. It is, of course, in black and white

and the characters are in dot matrix print, so it is not a striking chart, but for most applications it is adequate. Even in black and white, various textures can be applied to the bars and slices to make them stand out. A full page chart takes twice as long to generate and may sometimes look slightly less pleasing because the dots become more apparent.

The interface with the two Hewlett-Packard plotters works best (See Figures 1 and 2). I found, however, that Chartmon requires extensive handshaking with the plotter. My normal interface cable did not provide all of the needed data lines and I had to use a more complete cable from Graphic Software. The program prompts you to change pens when you are creating a multicolor chart with the two-pen plotter and selects certain pens for titles and chart outlines, allowing you to choose the

color and pen width appropriate to the chart. The ability to make overhead display transparencies with a plotter should prove very valuable in businesses and educational settings.

THERE ARE only so many ways to slice a pie.

Another valuable feature of Chartmon is its ability to put together a slide show on the video screen. Charts can be created and stored and then replayed in sequence using either keyboard cues or an automatic timing sequence. A double-sided 320K disk can hold a maximum of 18 slides per disk drive. This slide show is particularly impressive with the Chartmon II color display program. However, even in the monochrome version, the texture control provides good differentiation between data items.

Even with all of these features, there are a couple of things I could still wish for in Chartmon. First, it would be valuable to scale down plotted charts to something less than full page size. Presentations of two or even four charts on a page can be valuable. Chartmon does not provide this ability. Second, it would be useful to have a wider choice of fonts for chart titles produced on a plotter since plotters can do beautiful printing with striking effects. Different fonts can often be used effectively to set the personality or control the impact of the chart. Chartmon can specify titles by size and color.

Improving VisiCalc

VisiCalc will certainly be remembered in the technical history of the world as one of the major excuses used to justify the purchase of a personal computer. The addition of these books and programs to the VisiCalc makes the program even more appealing. Templates make it easier to enter data and to present it in a standard form, and graphics make it easier to understand the results. There are many challengers to VisiCalc and some heavy competition is on the horizon, but this kind of support will ensure the popularity and useability of the program for many years to come.

/PC

Figure 1: Sample pie chart using Chartman and Hewlett-Packard plotter.

MARKET NICHE & PRODUCT POSITIONING NEED OF LIQUID SOAP IN BAR SOAP DOMINATED MARKET

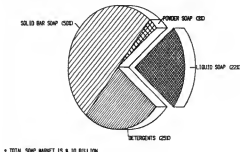
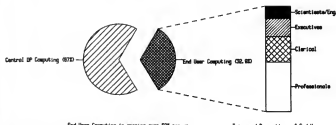


Figure 2: Sample pie chart using Chartman and Hewlett-Packard plotter.

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MBA	695	529
IT		
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BFM	130	88
SOFTWARE		
Acct Sys (easy)	725	656
SOFTWARE		
Sections	180	130
ER Personal Series	195	179
Tex Series	130	119

OFF		
on Analyst	250	199
ITION LIMITED		
IR Word Pro	350	255
Date Base	400	285
er BIK Words	250	199
IVE SOFTWARE		
Date Base	450	385
ign Ceta Base	225	175
Magic	280	225
Mag	30	70
North Combi	90	70
R Speed	480	115
SOFTWARE		
R	186	165
ESTMENT		
art E		Call
AR Tax Manager	250	199
OR Text Manager	100	98
OR Text Manager	250	199
Spelling	250	150
Matrimage	250	150
OFF		
MS-DOS	275	180
ERICAN BUS. SYSTEM		
Visualize	250	169
Visualize Data DBMS	250	185
Visualize	150	73

SOFTWARE	590	390
Writer*	389	239
Speller*	189	129
Writer	269	179
Select WP	595	337
Supercalc*	295	179
Superwriter*	395	260
STC Data Reporter	250	155
P		
256K	250	175
Viascript*	300	219
	250	189
	300	219
File*	300	219
	125	65
Plan 1	300	235
Forecasting Model	100	79

Completed	250	210
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ATED SIMULATIONS		
of Aphasi	\$40	\$30
ina	100	70

BRUND Apple Panic	30	22
ER Champ Blackacre	40	30

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A, or B)	40	30
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ACP has a complete staff of (5) five college degree engineers and programmers. Our team has reviewed the available hardware and software and a few products stand apart from others in terms of their technical superiority and proper optimization of the slots available in the PC.

The second card featured this month also comes from VISTA. The popular "PC Master" represents the highest level of multi-function I/O available on one card for the PC at any price. The "PC Master" features (2) two RS-232 serial ports which the primary serial port is configurable as DTE or DCE, it has a parallel printer port (IBM compatible), game joystick port, real time clock/calendar with auto recharge, Vortrax speech synthesis, 2 watt audio amplifier, and a Xebec/Seagate compatible hard disk host adapter (SASI compatible). All of this is on one card and is software supported with the exception of the host adapter which will be released in the 1st

We hope you agree that these products will provide you the maximum flexibility with your new PC. ACP does not want to see you purchase peripherals that you won't be happy with over the life of your PC computer. ACP offers 120 days factor warranty and also has a complete service center to take care of any of your IBM PC service requirements.

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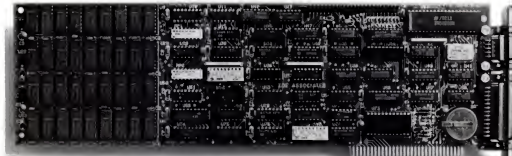
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This simple, menu-driven program produces sophisticated statistical charts and graphs to aid business and financial management.

Graph 'n' Calc Puts Numbers Into Shape

Graph 'n' Calc
Desktop Computer Software, Inc.
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List Price: \$249, compiled BASIC version
\$100 exte, interface for Hewlett-Packard
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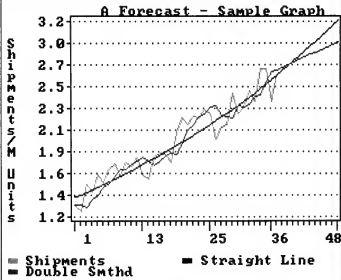
Graph 'n' Calc combines a graphic artist and a disk drive with an accountant in a single RAM chip. This program offers a capable graph-drawing utility with a modest spreadsheet program.

Graph 'n' Calc is designed to run on an IBM PC with at least 64K RAM, a color/graphics adapter, and one disk drive. A second drive or a hard disk system enables faster computation. The program

A S A
menu-driven program,
Graph 'n' Calc is
easy to use, but has
few of the problems
often associated with
menu operation.

has full color capabilities and would be best displayed on an 80-column RGB monitor. Monochrome displays driven by a color/graphics adapter are also possible.

Figure 1: Line chart with plots of three lines, generated by Graph 'n' Calc.



Graph 'n' Calc requires a graphics-capable printer such as the Epson with Greftrax. It is also possible to produce transparencies directly by using an asynchronous adapter and a specialized graphics plotter such as the Hewlett-Packard Pen Plotter HP 7470A. Software for this interface is available as an option.

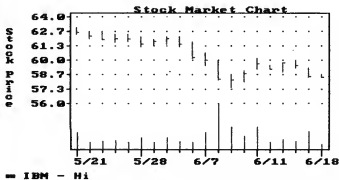
This program is also available in a compiled BASIC version that requires 128K RAM and a double-sided disk drive. The additional cost of this version is

largely due to IBM's licensing fees for compiled programs.

Visual Aids for Management

The presentation of statistical or numerical data in the form of a graph can greatly aid business and financial management decisions. Graph 'n' Calc gives the user the ability to plot trends, perform calculations, compare numerical information in bar or pie chart form, and perform some standard calculations. The program stores charts and graphs in a

Figure 2: Bar chart of plotted data, generated by Graph 'n' Calc.



"slide show" format for presentations.

Graphing and Planning

Data can be entered into a program in an array format. There can be as many as 100 columns down the horizontal axis and ten vertical rows. Both rows and columns can be named. The screen displays about six columns of data and ten rows at

a time. One array might look like this:

	1981	1982	1983
Sales	40000	35800	52300
Profit	4500	2350	8300

After entering data, the user may plot a graph or perform calculations using the

data. Graph 'n' Calc enables the user to graph information in several ways before running calculations. Often, the screen displays graphs help suggest how to manipulate the data.

After the initial information has been entered and the user has examined the possible charts and graphs, the results may be tested by using one of the various built-in functions of the program. These include linear regression; single-, double-, and triple-exponential smoothing; trend analysis; and other statistical financial considerations.

The program includes a well-organized operator's manual and a tutor that walks you through most of its applications. Almost every menu selection is illustrated and explained in the manual. Documentation is thoroughly indexed and made accessible by a comprehensive table of contents. The program also comes complete with a book, entitled *Fundamentals of Forecasting*. Users who are unfamiliar with the more advanced statistical capabilities of the program will find

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Graph 'n' Calc enables the user to plot a graph, and save to disk statistical or financial analysis, mathematical computation and forecasting data. Available calculations include growing over time (using percentage of increase or an added amount), exponential smoothing techniques, linear regressions (least square method), and logarithmic and square root transformations. The user can add, subtract, multiply, and divide, using data entered either into an array or entered directly from the keyboard. Computations can be added to an accumulator and inserted at desired points in the array. Some computer data can be saved and placed in the current array during computation. The user can also copy rows of data from one set of columns to another.

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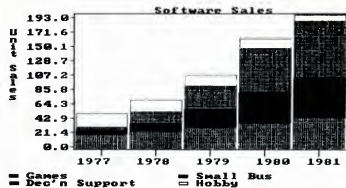
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Figure 3: Bar chart of stacked data, generated by Graph 'n' Calc.



Graphic Capabilities

Graph 'n' Calc offers a number of options for the forms of charts, including line charts with from one to three plotted lines (see Figure 1); bar charts with as many as four rows of plotted data (Figure 2) or stacked data (Figure 3); and pie

charts with as many as four different array rows on one chart.

The user may add horizontal or vertical headings. Horizontal grid lines are optional. The program automatically selects the size of units on the chart (hundreds, thousands, millions, etc.), but the

user may select the lowest value desired. For example, if the chart starts at 0, but the lowest data point is 1,200, the user can direct the program to move the lowest point on the graph to 1,000 or 1,100.

Convenient Menus

As a menu-driven program, Graph 'n' Calc is easy to use, but has few of the problems often associated with menu operation. The entire menu is visible all times except when graphs are displayed or when the system is moving from one screen to another. The user selects most commands with a single letter. Moving around in the array is simple and the screen design makes it difficult to become lost. The command line is located

GRAPH 'N'
Calc stores charts
and graphs in a
"slide show" format
for presentations.

in the center of the display, with the bottom third of the screen reserved for use as a "scratch pad" for display of current options or the results of calculations. There are delays while the program calculates, but they are not cumbersome.

Special Features

The color capabilities are a potential strong selling point for this program; you plan to use Graph 'n' Calc with a RGB color monitor or a color graphics printer. The screen can display as many as four different colors at one time, and the user may specify a second set.

The program allows users to define their own "module" for specialized calculations. It also allows transfer of variables from programs that store data in the DIF format, including many spreadsheet programs such as VisiCalc.

Graphs can be printed in one of two sizes: one that can cover almost an entire sheet of 8½- by 11-inch paper, another that covers only about a third of the sheet. I found the smaller graphs more useful for reports. However, since the graphs are generated with dots, the

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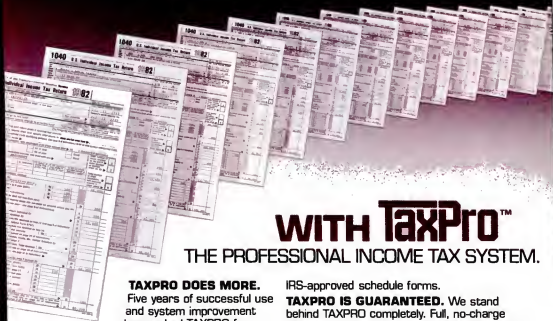
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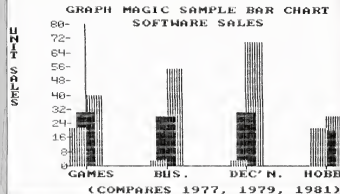
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Users who are interested in Graph 'n' Calc should also investigate GraphMagic, a similar graphing program that received high marks in an earlier review ("A Graphic Rendition," PC, Volume 1 Number 8). GraphMagic's requirements include 96K RAM (Graph 'n' Calc requires only 64K) and the BASRUN.EXE BASIC

Figure 4: Overlapping bar chart produced by GraphMagic.



compiler module.

GraphMagic will produce line, bar, and pie charts using various combinations of color, shading, points, grids, and statistical symbols. It includes computations for standard statistical mean, mode, and median, and can be interfaced with

the manufacturer's MotheMogic software for additional statistical functions. GraphMagic's labeling capabilities are limited and lower case letters cannot be used in graph legends.

GraphMagic cannot print charts where different elements are stacked in a single bar (Figure 3 shows a chart of this sort produced by Graph 'n' Calc). Instead, two or three sets of data can be printed as overlapping bars, distinguished from each other by the use of contrasting striped and cross-hatched patterns. Figure 4 shows such a chart produced by GraphMagic that is analogous to the stacked bar chart produced by Graph 'n' Calc.

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larger graphs give the viewer the ability to differentiate more detail.

Recommendations

Equipping the PC to take full advantage of this program can be expensive. It requires a color/graphics adapter, a graphics printer, and an RGB monitor. Color mix is not always optimum because of low contrast. It can be difficult, for example, to read red lines on a blue background.

Also, Graph 'n' Calc does not provide a full spreadsheet program, so it does not offer all the features a user might want in this area. In some instances, a separate DIF format program may be needed. The best advertisement for this program, however, is the fine work it generates. Graph 'n' Calc lives up to both parts of its name and does the job well.

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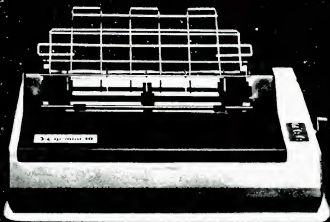
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*Computers come in two parts.
You have to buy both.*

We'd like to help. So here are a few suggestions about how to buy the computer that's right for you.

Computers come in two parts.

One part is the "hardware," which is the machinery itself. The other is the "software," or a program, as it's sometimes called.

Software is the part that tells the computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything.

And vice versa.

You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstration,

keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.



Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn.

Some people, however, will tell you that software has to be complicated to be powerful.

Nothing could be farther from the truth.

Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP

Good software keeps the communications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

The PFS family is designed the way we think all software should be: simple, straightforward and powerful.

Currently, three products make up the family. PFS:FILE, PFS:REPORT and PFS:GRAPH, with more programs on the way. Here's a little more about each of them.

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Basically, FILE works like a paper filing system, without the paper. So you can record, file, retrieve and review information in a fraction of the time it takes with a conventional filing system.

FILE lets you arrange your information in "forms" you design yourself. So you can get at and easily use your information in ways never before possible. What's more, FILE lets you change the original form without having to redo the information on it.

PFS:REPORT. Making the most of your information.

REPORT summarizes the information on your forms so you can use it to analyze, plan and make better-informed decisions.

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PFS:GRAPH. Instant pictures.

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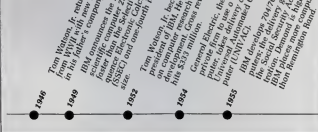
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After searching for its identity in the years following World War II, International Business Machines (IBM) became the leading manufacturer of mainframe computers. Other companies, however, began to dominate areas such as word processing, distributed data processing, and mini- and microcomputing. In the past few years, IBM has shaken off the corporate complacency that followed its enormous success in the fifties and sixties. Its decision to manufacture microcomputers reflects its renewed determination to remain an international corporate giant. In Part II of "Anatomy of a Colossus," PC Magazine explores the corporate thinking of the post World War II decades that led to the development of the IBM Personal Computer.

When Thomas J. Watson, Sr., the founder of IBM, took stock of his company at the end of World War II, he had every reason to feel satisfied. Corporate revenues from sales and rentals had quadrupled to nearly \$150 million. Factory space had tri-

IBM At A Glance



pled, and the number of employees had risen by more than half. Watson hed at his command the products, patents, research ideas, and funds to take advantage of the postwar technological opportunities spawned by military research during the war. Other companies did not pose a serious threat to IBM; its two primary competitors were hamstrung by internal considerations. AT&T was forbidden by federal antitrust laws from competing in any noncommunications field. RCA was primarily interested in developing television technology.

The absence of immediate competition from traditional rivals may have

accounted for the elder Tom Watson's uncharacteristically slow response to opportunities in computer development. IBM's business-based customers did not appear interested in the new machines, and Watson, ever the pragmatic salesman, had an ongoing bias toward his custom-

Anatomy Of A Colossus, Part II

IBM'S postwar history of betting the company—and winning—ushered in a new era of innovation exemplified by the Personal Computer.

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IBM At A Glance



immediate needs. On the surface his instinct appeared to be correct. IBM's product line of electronic calculators, tabulators, and accounting machines continued to do a brisk business.

Watson did not completely ignore the potential of computers. He was willing to do basic research and development for the selective sequence electronic calculator (SSEC), but showed little interest in marketing it. Watson turned 71 in 1935. He was preoccupied with the 600

IN ONE day, the Boca facility received over 500 calls from prospective applicants.

ies electronic calculator, which he promoted vigorously to existing customers. Watson's corporate posture was decisive; he wanted to protect the business he had spent 30 years building up. The company was drifting, as though awaiting other hand on the helm.

Watson and Son, Inc.

Born in 1914, in the midst of his father's all-consuming struggle to establish the fledgling Computer-Tabulating-Recording Company, Tom Watson, Jr. had in the beginning been groomed for the company's chairmanship. He had made his first tour of an IBM factory at the age of 10, and had earned a place in the prestigious 100% Club his first year out as an IBM salesman. "The company is in the

family unconscious," his father once remarked.

Watson, Jr. attended Brown University in 1933 and developed a reputation as a bar-hopping, athletic playboy more interested in yachting than in serious business pursuits. After a stint as a bomber pilot during World War II, he focused on IBM. "Frankly, I can hardly wait to begin," he wrote to his father shortly before receiving his discharge. Watson, Jr. apprenticed, first with his father, and then with IBM Vice President Charles Kirk. He became familiar with the company's operations and was introduced to the work in progress, particularly projects relating to computers. In looking back on this period, Watson recalled that his father "had a large desk and I simply had a chair pulled up at the edge of what he did."

By this time, the general public was becoming increasingly interested in computers and their potential applications. Articles began appearing in popular magazines about the "giant brains." Theoristicians and researchers, following the lead of computer pioneers John Von Neumann, J. Presper Eckart, and John Mauchly, scouted for research dollars to fund and develop their computer ideas, which were of great interest to the Weather and Census Bureaus, but had no clear commercial applications.

The impetus of research, coupled with Remington Rand's placement of several Universal Automatic Computer (UNIVAC) machines in what had been exclusively IBM accounts at the Census Bureau helped catapult IBM into the production of computers. According to corporate mythology, Tom Watson, Jr. and several key IBM executives returned from a tour of Korean War era defense plants report-

ing that computers would contribute to productivity and development. "If that is what is needed," Watson, Jr. is reported to have said, "let's build them."

Betting the Company

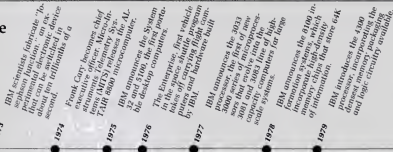
The elder Watson agreed. He backed his son before IBM's Board of Directors and gave him virtually a blank check to proceed with computer research and development. To many, however, it appeared that these gestures had come too late. Remington Rand's position with UNIVAC was nearly unassailable. Technologically, it was 2 years ahead of IBM and all competitors. "UNIVAC" had practically become a generic term for computers in the public mind.

IBM began waging computer wars on several fronts. Work began in IBM laboratories on the 702, a commercial version of the earlier 701 research computer. At the same time, IBM researchers began exploring more advanced technological concepts. The company established a management task force and a Data Machine Division, both designed to deal specifically with computer technology. T. Vincent Learson, an aggressive IBM sales manager

IS IBM just another stodgy, mature company?

and troubleshooter, was placed in charge of the new Electronic division. The entire scenario was a calculated risk, a gamble of immense proportions and high stakes. IBM was "betting the company."

IBM At A Glance



Several careers hung in the balance. Foremost among these was the namesake of the founder, now on center stage, attempting to follow his father's difficult but immensely successful first act.

A recurring problem began during this time; the 700 series under development would, if successful, compete with IBM's existing base of 600 series calculating machines and destroy this product line. Rapid development in computer technology makes this a problem even today.

IBM called the gamble correctly. It announced the 704 and 705 machines, which competed with existing UNIVAC models. The first orders were placed with the mammoth Social Security Administration. By the mid-fifties, the lead in computer technology passed from Remington Rand to IBM.

During this period, IBM's internal focus shifted. While salesmen were still important, increasing emphasis was placed on research and development

decentralizing its previous monolithic structure. From this moment in 1956, the company was directed by a Corporate Management Committee that consisted of the Board Chairman, the President, and six senior executives. IBM's highly-motivated sales force was instructed to woo clients from old machines (calculators) to computers. The emphasis on R&D continued to grow. The powerful Research Division was created and given carte blanche to proceed with plant expansion and the addition of personnel.

On June 19, 1956, Thomas J. Watson, Sr. suffered a heart attack and died. Tom Watson, Jr. was on his own. "It's going to be lonely around here," he told reporters. "Whenever I got a real hot one, it was always a comfort to be able to go upstairs and discuss it with my father."

The Flourishing Fifties

By the middle of the decade, many firms were still technologically superior to IBM. Sylvania had originally evolved the vacuum tube. Transistor technology had been developed by Bell Labs in 1948 (AT&T used this technology only in telephone switching devices); Philco, RCA, and General Electric had tested transistors in experimental computers that they never developed.

As a frontrunner, IBM faced several disadvantages. The prospective market for business computers was not well defined. Nor could IBM predict the offensive moves of the competition. Computer technology entailed steep, unprecedented R&D costs, while profit margins and the overall pricing structure of the new machines were yet uncharted. In short, computers were still a gamble, the dice still rolling, the company still on the

line.

By 1958, IBM was barely holding its lead in the now-booming computer field. It was pitted against such technical superior giants as the newly-men-

THE PC
represents a mere 2 to 3 percent of IBM's total revenue.

Sperry-Rand Corporation, Burroughs, National Cash Register (NCR), and Bend Sin. The fact that the first generation of computers was based on temperamental vacuum tubes (which generated such heat that they required water cooling) were in constant need of repair, strengthened IBM's position. This helped cement its reputation for product support and service with corporate clients.

However, there was no doubt that the production cycle of the first generation computers was rapidly drawing to a close. IBM made a costly misstep at the juncture, developing a giant "Strat" computer system that was powered by vacuum tubes, when transistor technology was just getting started. Obsolete before it came on the market, the Strat fiasco caused a \$20 million loss. For years following this debacle, IBM abandoned work on large computer systems, focusing instead on the middle range.

1959 marked the debut of a second generation of computer technology. Vacuum tube computers were eclipsed by those built with transistors and other

THE COMPANY seemed to be drifting as if waiting for the next challenge.

(R&D). The contributions made by scientists and academicians vied for the recognition formerly reserved for members of the 100% Club. IBM expanded rapidly, soon boasting dozens of product lines sold all over the world.

Under Tom Watson, Jr., the company reorganized in Williamsburg, Virginia,

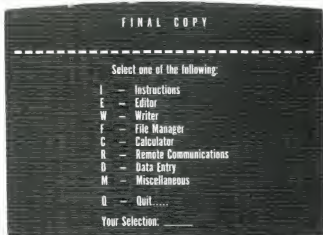
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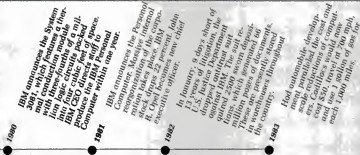
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IBM At A Glance



"solid state" devices. The new computers employed ferrite cores for memory, and magnetic disks and tapes for storage.

Transistors were 1/200th the size of vacuum tubes and were significantly faster. They could multiply two 10-digit numbers in 1/100,000th of a second, dramatically lowering the cost per calculation. They were far more compact, less likely to overheat, and much more dependable than their first-generation

counterparts.

Computers were by now in vogue in many businesses. Most were used for such prosaic tasks as processing payrolls and maintaining inventories. To many companies, a larger computer was considered an exotic and impressive status symbol; the more blinking lights and rapidly spinning tape drives that could be shown off to clients, the better corporations felt about their expensive purchase.

The Soaring Sixties

During the early sixties, Navy Department scientist Dr. Emmanuel Piore was placed in charge of research at IBM, given unlimited authority and resources to develop third-generation technology. IBM was spurred on by its competitors who collectively claimed one-third of the market. Later referred to by industry analysts as "The Seven Dwarfs," IBM's main challengers in computer technology

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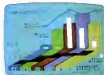
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sales were Sperry-Rand, the Control Data Corporation, Honeywell, Burroughs, NCR, RCA, and General Electric. By 1961, data processing applications dominated the research effort at IBM, which then was earning three out of four sales and rental dollars from computers and related products and services.

The third computer generation began in 1964. Early transistorized computers had been plagued by incompatibility. Programs had to be rewritten when they were switched between computers, and peripherals wouldn't work on any but the system for which they were designed. In a daring move referred to by many industry watchtowers as "the great gamble," IBM announced development of a revolutionary concept: the 360 System, an entire family of compatible computers based on integrated circuit technology. If successful, this technology would allow the free exchange of peripherals and programs. Spending over \$500 million to build six new plants and attract new researchers, programmers, and designers, IBM's dedication to this single line of computers placed its lead in jeopardy. If the project failed, "Snow White" stood to lose half its market share, a mortal wound.

The 360 attempt was a companywide effort that coordinated IBM's domestic and international operations and allowed

niques for the first time. He also planned to create an entirely new line of software to accompany the 360 series. IBM and the rest of the industry held its collective breath.

The first 360 series was installed in 1965. It was an unprecedented success that reshaped basic concepts regarding compatibility that had been held by the entire industry. The 360 also helped accelerate the growth of several important sub-industries, notably service firms that sold data and experimented with time-sharing for large systems, computer leasing companies, and the resale market. Several key IBM executives besides Tom Watson, Jr. received their battle stars during the 360 campaign; T.V. Learson, Frank Cary, and John Opel were critical to the company's success and would remain so.

The Sleepy Seventies

By the early seventies, a form of corporate lethargy set in. IBM executives were still basking in the reflected glow of the 360 victory; the company seemed to be waiting for the next challenge. The third computer generation production cycle was still being played out, and the mainframe industry had become relatively mature. However, competition was growing at an unprecedented pace. Plug-compatible manufacturers, producers of peripheral equipment, leasing and service companies, and companies that focused on specific product lines were all jostling for position in the computer industry. Mainframe companies were struggling to carve out or retain specific niches in this market. NCR and Burroughs had focused on banking. Control Data concentrated on major systems; UNIVAC and Honeywell were "slip-streaming" behind IBM, covering clients' overall data processing needs.

In 1970, IBM introduced the System 370 family of compatible computers, which, though superior to the 360 series in terms of price, flexibility, and speed, represented no quantum leap to a fourth technological generation.

The 370 series used magnetic cores and integrated circuits to perform memory and logic functions. Based on the twin concepts of "monolithics" and "large scale integration," the System 370 compressed transistors and circuits onto silicon chips and used "virtual storage" to

magnify the main memory and enable programmers to access the entire machine.

The refinement of large scale integrated (LSI) circuitry placed the equivalent

TO MANY companies, a large computer was considered an exotic and impressive status symbol.

100,000 transistors on a chip. This breakthrough catapulted the industry headlong into its fourth generation, underscored the philosophy of "lead, follow, or get out of the way."

IBM had no intention of following getting out of the way. But as late as 1970 it was still hovering on the verge of change. It announced the 8100 system designed for use as a network. The system reflected IBM's executive-level interest in distributed data processing (remote computing), telecommunications, and networks—all untraditional, nonmainframe areas that IBM would later exploit fully.

Microcomputer Wars

In 1974, a New Mexico-based electronics firm, Micro-Instruments Telecommunications Systems (MITS), produced the ALTAIR 8800 microcomputer, which sold for \$400. The Altair was designed primarily for the hobbyist and lacked adequate software, yet its 1,500 sales in the first year encouraged others to enter this inflection field. When Radio Shack began offering microcomputers in 1977, the new industry began developing rapidly.

As in any fledgling industry, high mortality rates claimed many entrants. Mistaken calculations in design, production, marketing, or pricing could drive an undercapitalized firm from the market. The production cycle for microcomputers was extremely compressed; price cuts were rampant; and machines were obsolete soon after introduction. In short order, two leaders emerged: Tandy/Ra-

THE FIRST 360 series reshaped basic concepts regarding compatibility.

each division to contribute ideas. The technique of placing multiple computers on a single chip had been developed by Bell Labs in 1955 but had never been implemented. The 360 "machine family" series was designed to include the large computers abandoned by IBM since its abortive 1955 Stretch project. Control Data Corporation had stepped in to the large computer market after IBM deserted it. Watson planned to mass produce the machines, using assembly line tech-

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hack and Apple. These were followed by Commodore, BASF, and Verbatim. All attempted to carve out niches in the new market and were collectively successful enough to generate revenues of \$150 million in 1979.

Such figures could not be ignored, even by mainframe-oriented IBM. Although none of the mainframe companies had experience in consumer production or marketing, old-line mainframers such as Texas Instruments and Digital Equipment entered the fray by 1981. In the early eighties, IBM claimed 70 percent of the mainframe computer market, but trailed Control Data in software and services; Hewlett Packard in minis; Wang in word processing; AT&T in communications networks; Motorola and Intel in integrated circuit development; and Apple, Commodore, and Tandy in microcomputers. The situation would get worse before it got better.

In 1979, a Business Week article asked, "Is IBM just another stodgy, mature company?" It seemed so. By 1980, serious

chinks had appeared in IBM's corporate armor. IBM's stock on Wall Street was stagnating; the Justice Department's long-drawn out 13-year antitrust suit was sapping time and energy at corporate head-

***I**BM WAS barely holding the lead in the booming computer field.*

quarters in Armonk, New York; and IBM's growth rate had slipped below smaller new companies that had snatched the lead in related industries.

By 1981, IBM's stock was down 22 percent. Its market share in computers had slipped from a commanding 60 percent lead in 1970 to 32 percent in 1980, during a decade in which the information pro-

cessing industry had grown fivefold. IBM continued focusing on mainframes while the world outside had been radically changing. The corporation had traditionally waited until a new market reached critical mass by letting other companies do the groundbreaking. But this appeared to be a serious miscalculation. IBM had failed to establish a competitive position in the microcomputer, distributed data processing, and office automation markets.

The annual growth rate of the microcomputer market was predicted to exceed a phenomenal 40 percent in the early eighties and to result in sales of \$80 billion by 1985. Apple had made substantial penetration into several large IBM accounts and the situation recalled the UNIVAC scare in the late forties. IBM was ready to enter the retail market, but was it too late?

Design by Committee

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prices. According to a study performed by Strategic, Inc. in San Jose, California, "IBM submitted a parts list to its Lexington Manufacturing facility, and estimates on the mass purchase of parts ran higher than the retail price of the personal computer itself." IBM's marketing and engineering teams had been studying the field for years and had actually built several prototypes.

The decision to proceed was made by a Corporate Management Committee (CMC) whose members included chief executive officer Frank Cary, John Opel, George Beltzel, Paul Rizzo, Dean McKay, and three senior vice presidents. In July 1980, Frank Cary gave the go-ahead. He announced that he wanted the IBM Personal Computer or "PC" built within a year. After Cary's ultimatum, the initial PC design was approved at a CMC meeting 1 month later. The design team for the PC originally consisted of a 12-man group of engineers headed by William L. Sydnas, now the manager of the Entry Systems Boca engineering group. Looking

back on that time, P.D. Estridge, Director of the Entry Systems Business Unit at Boca Raton, Florida, where the PC was produced, admitted, "It helped . . . having the direct support of top management. It also helped if you didn't need much sleep." And, he added, "the timing was

BY THE
*mid-fifties the lead in
computer technology
passed from
Remington Rand to
IBM.*

critical; we believed we had the right product at the right time."

After receiving the go-ahead from Armonk, the staff received authorization to expand from 12 to 150 by the end of

1980. In one day, the Boca facility received over 500 calls from prospective applicants as word spread inside IBM plants and offices across the United States. When the dust settled and the phones stopped ringing, 40 members of the new design unit were hand-picked from the Boca site. Most of the rest were IBM-Boulder alumni or veterans of IBM Poughkeepsie and Kingston facilities.

Besides William Sydnas, other key members of the early team were W.C. Lowe, who acted as the director of the development lab at Boca (Lowe is now the Information Systems Division Vice President at IBM, Rochester); P.D. Estridge, Director of the project, responsible for overall development, programming, manufacturing, sales, service and distribution of the PC at Boca Raton; D.W. Willis, Manufacturing Manager; and H.L. "Sparky" Sparks, Manager of Sales and Service. W.C. Lowe recalled that "It soon became clear that a truly competitive microcomputer could emerge only through traditional ways."



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"Untraditional" proved to be an understatement. From the beginning, everything about the PC broke with IBM tradition. Given the prohibitive costs of producing the PC in-house, it was decided that most of its components would be manufactured by third party vendors while the assembly would occur in Boca Raton.

UNIVAC HAD practically become a generic term for computers in the public mind.

Bids were opened. IBM's System Communication Division Lab in Raleigh, North Carolina, successfully bid on the keyboard. Manufacture of the display monitor was assigned to a company in Taiwan. And Microsoft, a software firm in Seattle, won the contract to produce most of the basic software for the PC, including the code for the PC's new operating system. As quickly as possible, the Boca engineers flew the prototype microprocessor to Seattle and turned it over to the Microsoft design team. "If any of our cost commitments had gone up so much as a hair," Lowe recently reminisced, "we might have lost the product. We were pursuing big volume sales to consumers."

Third party components were sent directly from their places of origin in the United States and overseas to the Boca Raton manufacturing facility north of the main IBM plant. There, the manufacture and assembly of a PC takes from 4 to 6 hours. The facility employs 20 assemblers, who bolt units together around the clock, Monday through Friday. Half of them work on an automated line, half on a manual line.

Other Breaks with Tradition

The PC's marketing practices have also incorporated several breaks from IBM tradition that would have been considered heresy 10 years ago, but are now accepted with a philosophical shrug of the shoulders. For instance, IBM initiated a Submitted Software Division in Boca

Raton to solicit and evaluate software submitted by programmers both inside and outside the company.

When IBM first approached ComputerLand asking it to handle a portion of the PC merchandising, the nationwide retailer wasn't interested. "Then Don Estridge demonstrated the design and ComputerLand got excited," says Lowe. Other low-cost distribution avenues were pursued. IBM Product Centers, Sears Stores, and authorized independent dealers were chosen to distribute and service the PC. By May 1982, there were 650 IBM dealers in over 200 locations throughout the United States marketing the PC.

Breaking a 70-year tradition of in-house IBM servicing of products, IBM agreed to train Sears, ComputerLand, and independent authorized dealers, enabling them to provide warranties and service to PC customers. Individual stores regarded servicing as a source of revenue.

IBM underwent a massive internal reorganization in the Fall of 1981 that streamlined and refocused the entire organization to shift the marketing, manufacturing, and product development efforts from a functional to a product orientation. Designed to zero in on specific market segments, the reorganization also attempted to reduce internal competition that had developed among IBM's three main divisions (Data Processing, General Services, and Office Products). It also resulted in the creation of a new Information Services Division that combined manufacturing and development operations.

With the advent of the PC, IBM implemented other innovative consumer-oriented techniques. It hired the advertising firm of Lord, Geller, Frederico, and Einstein, Inc. in New York to design a media campaign based on the Charlie Chaplin motif. Dealer training sites were set up in San Jose, California and at Boca Raton. Toll-free hot lines were established for dealers, to ensure expert back-up troubleshooting when necessary.

The PC Today And Tomorrow

The PC represents a mere 2 to 3 percent of IBM's total revenue, but is a major part of the public's consciousness of IBM. The inaccessible Armonk has surprised everyone. "With the PC," an IBM Boca spokesperson said, "IBM has entered the world." The remote colossus has de-

signed a computer for modern times.

The IBM Personal Computer is used for countless applications in a variety of corporate, educational and personal settings. Connecticut Mutual Insurance Company and Treveler's Insurance Company have each purchased 1,000 PCs. General Electric's Information Systems Company has placed 2,000 in its Data Services Bureau. The United States Federal Reserve System currently leases 4,000 IBM Personal Computers to users for payment transfers and to cut monetary "float time." Some universities are even requiring students to purchase the PC to promote what has come to be known as "computer literacy." Carnegie-Mellon has instituted a 10-year plan to develop a model electronic campus and has signed an agreement with IBM to develop a new 32-bit PC and to install 1,000 microcomputer work stations on campus by 1990.

THE inaccessible Armonk has surprised everyone.

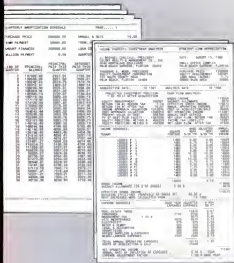
Similar pilot programs are planned at Harvard, M.I.T., and Ohio State.

The future beckons. To quote Don Estridge, "The potential for the microcomputer? You can get an idea when you realize that only 2 percent of this country's 80 million homes, 10 percent of the estimated four million small U.S. business firms, and 2 to 3 percent of those companies that employ one-half of the white collar workers in the United States have them. Additionally, there are 100,000 elementary and secondary schools and three million self-employed individuals. This leaves a lot of room for using these machines to enhance personal productivity."

Though PCs account for only a small percentage of total sales at IBM, the resilience that fostered development of an IBM microcomputer suggests the Colossus of Armonk isn't finished growing. Next month: Part III, the final installment of "Anatomy of a Colossus."

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First, the question: Is there a program available that allows PC users to create a simple, flexible, customized, computerized data base and filing system?

What Is (The) Answer?



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List Price: \$295 (includes report
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For years, the average company required two kinds of employees to run its data base management department: keypunch operators and data-processing managers. These specialists placed information into the system and prepared data for executives who had little contact with computers, terminals, or printers.

Times have changed, as a review of

any business or trade journal will confirm. Many computer companies now target the executive suite in their marketing schemes by touting the advantages of microcomputers and related software for the modern executive. The addition of computers to the executive's tool chest has led to the creation of specially-written programs. These are intended for managers rather than subordinates, to establish and maintain their own simplified, yet flexible, data bases.

Fitting right into this corporate niche is Answer from North American Business Systems, Inc. The program was designed especially for network compatibility, but also lends itself to single-user applications. It features an electronic card file.

You can design each blank "E/card" to fit nearly any purpose. At almost any point, Answer will provide a directory of E/cards should you forget what you have in storage (see Figure 1). Information can be entered in predefined fields or free-form areas of your choosing. An E/card can then be recalled, examined, updated, or removed whenever necessary. Since Answer splits the monitor display into two screens, you can examine two cards simultaneously.

Answer's ability to cross-reference information in a nearly unlimited fashion makes it even more flexible. In effect, you have rapid access to numerous card files, each with a different function. And it's not necessary to retype information for each file. In many respects, the program resembles a set of accordion file folders. It expands and contracts as necessary to accommodate information.

Requirements and Compatibility

Although less than a year old, Answer is already available for many of the more popular microcomputer systems, including the IBM PC, TRS-80, Osborne, NEC, Zenith, and Apple. The program is written in Fig FORTH language, which is provided with the package. Fig FORTH is transportable from one computer to another; according to the creators of An-

swer, this allows users to telecommunicate files between different types of machines.

One drawback is that none of the versions of Answer use the PC's special hardware features, such as function keys. While this approach speeds development of programs and increases compatibility between computers, it is annoying that the program does not take full advantage of PC power.

Answer requires PC-DOS 1.1, at least 64K RAM, and one single- or double-sided disk drive. But, as with most word processing programs, additional RAM and

another disk drive or hard disk will allow greater user freedom and document accessibility. Answer supports most popular printers and accesses most ASCII graphic characters.

North American officials say their program is intended for middle managers and professionals frustrated by the volume of paperwork they face in their day-to-day work. According to North American, anyone who maintains a calendar, schedule, file, or list could benefit from Answer. Managers, supervisors, small business owners, and writers will find many applications for the E/cards. Infor-

mation can be quickly edited, updated and cross-referenced on any storage device. The program accommodates client files, parts lists, order tracking, calendar reports, expense control, the appoint-

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information can be
placed on a disk.

ments calendar, catalogs, patient histories, project management records, and story references.

Learning the Answer

Answer teaches users through computer-aided instruction. The program provides sample E/cards for user practice (see Figure 2). If you possess reasonably good typing skills for forms creation and initial data entry, and patience in learning the program's field requirements, you should become comfortable with the program after several days. After the information is Saved and Sorted, a Browsing routine lets you find data with a partially completed field. This means you can type the first letter or letters (number or numbers) in a field, then ask the program to find the closest match—a real benefit to those who hunt and peck through the keyboard.

First-time setup of Answer involves completing an electronic registration blank at program start-up. While Answer is not copy-protected, unregistered copies continually display the message, "<<ANSWER>> unlicensed," on the monitor and on every page produced by the printer. North American believes few unauthorized users will want to live with that constant reminder.

Data Comparison

The program divides the PC monitor screen horizontally into two sections or "portals." This procedure allows you to enter data in one E/card, compare it with a different E/card, and then reference the

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Figure 1: Example of program-generated directory and corresponding user-created E/cards.

```
<< forms within volume:MAIN >>=====
NAME & ADDRESS          CALL REPORT
TODAY'S PROJECTS

=====

volume:MAIN, form name:NAME & ADDRESS=====
===<Date_Day: Month: Year:19 ;>=====NAME_AND_ADDRESS_CARD=====
<Company:                                     ;>
Contact_Last_Name:                           ;First:      ;>
Title:                                       ;>
<Address:                                     ;>
<City:                                     ;>State:   ;<Zip:       ;>Phone: (206)  -   ;Ext:      ;>
Annual_Sales:$                             ;Employees:   ;CED:      ;
Company's_Business:

Brochure_Mailed_Y: /N:                    Talked_In_Person_Y: /N:                By_Mail_Y: /N:
=====
volume:MAIN, form name:TODAY'S PROJECTS=====
===<Date_Day: Month: Year:19 ;>=====THINGS_TO_ACCOMPLISH_TODAY=====
Call:                                     Call:
Call:                                     Call:
Call:                                     Call:
1):
2):
3):
4):
5):
6):
=====
```

information between E/cards under a common subject name.

At startup, Answer presents several options: Answer (enter the main program), Back Up disks (North American recommends the faster DOS Diskcopy), Sort all stored information, Configure for specific hardware options, Register the program, end Valldete (to remove the "unlicensed" message). With Answer, the FORTH language is accessible from the Start-up Command Line.

Choosing the Answer option loads the main program into memory and presents the Main Command Line. You are then free to remove the program disk and use the drive for data disks. Actual operation moves through several modes: Help, for overall program assistance; Media, to control all storage functions; Portel, to activate and use each screen; Volume, to manage all data stored on the media;

Forms, for form creation; Information, to enter data on forms or search for it later; Reference, for cross referencing; and Answer, for program utilities, including sorting, activating/deactivating video attri-

ANSWER scores its biggest coup in the Cross Reference Mode.

tributes and automatic prompt line, advancing printer paper, and quitting the program. Each of these modes, in turn, leads to other functions. This may seem confusing, but Help screens are available in any mode or command level when you press

the H key.

Answer prompts you with a horizontal menu line in reverse video at the bottom of each portal. This Command Line also acts as a status line. Most of the commands are user-friendly and involve logical steps. You enter the first letter of the command (e.g., D for directory, F for format, or E for edit), and Answer prompts you through the next level of commands. The Esc key can move you between various command levels or can return you to the Main Command Line if you get stuck in a function.

Forms creation is relatively simple. E/cards can contain Fields, which are blank positions for data entry; and Index Fields, which are specific areas used to look up information later. Rigid rules must be followed for both types of fields; otherwise, errors are likely to occur. An E/card must have at least one Index Field, which must

EASYTEXT provides the features of an expensive word processing program and then some, at a fraction of the cost. Prepare files using your favorite text editor, then pass them through EASYTEXT for formatting. The program performs fill and justification (straight right margins), pagination, page headers, footers and numbering, indents, hanging indents, centering, underlining, bold print and more. The software allows multiple text and justification buffers for automatic preparation of index and table of contents. Escape sequence codes may be passed through for printer control without affecting formatting. Inclusion feature allows incorporation of form letters of standard paragraphs from multiple files. Output may be directed to the screen, printer, or to a disk file for complete flexibility.

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EASYEDIT is a two-dimensional cursor based screen editor. The CRT is a window into the file being edited. Function keys are used to perform simple operations which are immediately reflected in the file as displayed on the screen. The screen window may be positioned to display any part of the file. Cursor motion keys allow changes to be typed anywhere on the screen. **EASYEDIT** can edit files larger than its memory size buffers, and it offers split screen display for the concurrent editing of two files.

\$79.95.

Check your documents for accurate spelling with a program carefully crafted to fit your machine and budget. EASYPROOF detects misspelled words in documents created by most text editors and word processors. This program's flexibility allows you to customize it to your needs, make them in your document for easy editing, or add them to your dictionary. EASYPROOF also allows you to create a small, fast file to compress an effective dictionary of over 50,000 words into fewer than 4K bytes of disk space, for smaller than other spelling programs. Fast in-memory processing allows EASYPROOF to find misspellings in documents with over 99.8% of misspellings while minimizing false reports of correctly spelled words. You can add new words, prefix/suffixes, even customize for British spellings.

This simple, easy to use calculating tool can be used to compute your budget, record and project your investment returns, even do your taxes: EASYCALC provides the most important capabilities of a two-dimensional "what-if" calculator. It calculates totals, averages, labels, variable column widths, and print to line printer or disk file. Yet EASYCALC is unique easy to use with a minimum of function keys of the IBM PC providing a true full-screen editor "feel" in the rows or columns to compute. Simple keyboard commands allow operations on entire rows or columns to copy, delete, insert, and move. EASYCALC avoids complex restrictions on internal cross-referencing found in other spreadsheet programs; compact internal data format stores more values, and uses less space. EASYCALC makes it easy to get started with "templates," which automatically compute your full IRS Form 1040 and itemized deduction Schedule A.

This powerful and yet, easy to use file management system is designed for the first time user. Completely menu driven and with documentation exceeding 400 pages, EASYDATA allows you to quickly develop, prototype, and install your applications with minimal effort. Over eighteen processing programs comprise the system, including screen definition, data entry, report generation, label processing, and other system utilities. Unique data management structure eliminates sorting during data extraction or report generation. Comes complete with comprehensive mailing list example.

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begin with a <, contain a label followed by a :, define the entry field by a series of periods, followed by > to conclude it. Labels in both field types may contain no blank spaces. This could present a problem if a label has more than one word. You may, however, type a hyphen, slash, or underline, to tie multiple words together, making the label understandable to both you and the computer.

Index Fields

A form holds a maximum of 50 index fields no longer than 80 characters, including the required symbols. Each

Index Field defines a sort sequence for the program, which stores this field in a separate location from the rest of the information on a card. In addition, free-form entry lets you type anything in the undefined fields. You may use reverse video and emphasized text at any point on a form, although these attributes slow down the initial presentation of a card. A form is retained by pressing the Esc key and S (for Save).

E/cards are very adaptable. One used as a customer file could, for example, include the date, company name, address, contact name, and title. Other cards

might describe the products this customer has purchased, what services he or she still requires, or details about call reports. The beauty of Answer lies in its ability to access seemingly endless amounts of data. If, for example, a card has 35 index fields, it can be found 35 ways. Answer sorts all stored information by sequential index field data. When filled in, index fields require additional storage space and sorting time. Blank fields, however, do not require extra space or time. This feature gives you a chance to design your cards for future growth, without consuming time or space before the fields are filled.

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PROGRAM support, charged at a hourly rate, is available by phone.

Key Fields

When designing the form, you should give some preliminary consideration to how a card and its fields will be used. Only the index or "key" fields can be tapped to recall an entire card's content later. Enough key fields will present sufficient flexibility for finding your information, without wasting too much storage space. Once the form is created and saved, it's called into a portal for data entry in the Information Mode. A form directory can be shown on either portal, be sent to the printer. All of the form editing commands, including video attributes, are also available in this mode. A blank or completed E/card can be printed during this (or almost any other) mode. Make hard copies of your electronic records as needed. This is especially handy when Answer includes a daily appointment calendar; you simply call up the calendar for the day, check all cross-referenced material, and have the printer take care of the rest for you.

Once you open a card, you can type information into any empty field. The Tab key moves the cursor from field to field, and the Return/Enter key moves the cursor to the first free character on the

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Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

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Duplex = Half Baud = 300 Drive = A: Capture = OFF Lines = 0
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SOUTHEASTERN SOFTWARE — DATA CAPTURE/pc

Duplex = Half Baud = 1200 Drive = A: Capture = OFF Lines = 0
Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

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Duplex = Half Baud = 300 Drive = A: Capture = OFF Lines = 0
Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

SOUTHEASTERN SOFTWARE — DATA CAPTURE/pc

Duplex = Half Baud = 300 Drive = A: Capture = OFF Lines = 0
Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

SOUTHEASTERN SOFTWARE — DATA CAPTURE/pc

Duplex = Half Baud = 300 Drive = A: Capture = OFF Lines = 0
Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

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Duplex = Half Baud = 300 Drive = A: Capture = OFF Lines = 12
Transmit = ON Echocall = OFF Linetest = OFF Linfill = ON Prompt = 10

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CIRCLE 420 ON READER SERVICE CARD

next line. Pressing Esc and S saves all the data. There are two routines for recalling information: Browse and Find. If cards have gone through the program's sort routine, Browse easily looks up any card. If cards have not been sorted (such as during an Information session when new forms and data are saved), you must complete one key field—an entire name or date, for example—and use the Find routine. To use Browse, position the cursor in any index field, type in part of the information needed, hit Esc, and press B for Browse. To look up all the information on "Adams," for instance, you could type

a, ed, ede, edem or adems (the program ignores case during Browse or Find), and ask Answer for the closest match (see Figure 2). If there is more than one, you can browse Forward or Backward through the names until you find the required card.

Cross Referencing Info

Answer scores its biggest coup in the X (Cross Reference) Mode. Executives who would like a client's credit record, pest order history, phone records, complaints, etc., can reference any or all of these records to each other. Information is linked by filling in a form in one portal

(through Browse, Find, or by simply completing a blank form), and doing the same with another form in the second portal. You reach the X Mode by pressing the F and X keys. Pressing S for save prompts Answer to ask for a cross-reference subject. Entering an appropriate subject name then will save the reference. The

NONE OF THE versions of Answer use the PC's special hardware features, such as function keys

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procedure works between any hard disk or floppy disk drive. The program will even report which disk to put into the PC if the cross reference is not on one currently in the computer.

Answer compresses all data before storage. Consequently, a tremendous amount of information can be placed on disk. The program uses variable length random access records, making it difficult to pinpoint exact storage numbers. North American says about 250 records will fit on a single-sided disk. The Stetus command reveals how much space is left on disk. Answer works especially well with hard disk drives (I used a Corvus 6-megabyte during my tests). Additionally, North American reports that it has received excellent comments from organizations that use Answer with both P and Net and Corvus networks. Computer developers included systems in Answer that prevent multiple users from calling up and altering the same card at the same time.

When Answer was tested, no report generator was available. It should be available soon if it hasn't, in fact, already hit the market. According to North American, current Answer owners will be offered the reports generator program at a discount.

Simplified Support

The manufacturer maintains a fairly liberal policy regarding upgrades. At the time of registration, you are given the

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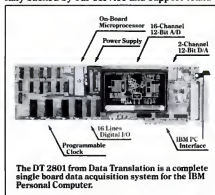
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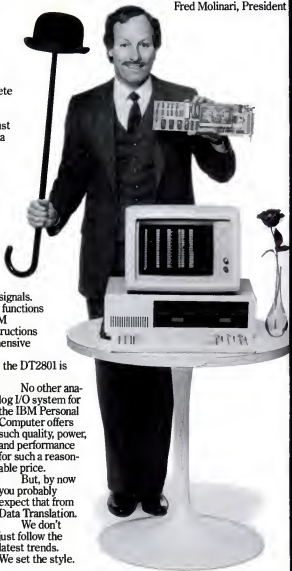
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CIRCLE 698 ON READER SERVICE CARD

portunity to receive new versions by burning the original program disk (after making sufficient backups) along with a fee. When an upgrade comes out, North American automatically ships a copy to owners. Program support,

APPLICATIONS for Answer are limited only by the creativity of the user.

arged at an hourly rate, is available by ne.

Applications for Answer are limited by the creativity of the user. Almost everything works smoothly, efficiently, with a minimum of fuss. Error handling appears to be good, because program designers have emphasized error prevention. The Esc key gets you out of most problem situations, and Help is always available by pressing H.

Missing from current Answer versions is the ability to move forms between disks. This means you must be certain of a permanent location of a form before it is created and saved. The company plans to install this capability in future releases.

Documentation is the weakest link in Answer's package. The company has chosen to put most of its efforts into a relatively new area: computer-aided instruction. Still, the novice will tend to peruse the manual when the software package arrives. And Answer's large number of function options, described on a fold-out quick-reference sheet, can frighten some—especially Answer's intended market; most executives have never put their hands on a keyboard before.

Answer requires some proficiency with the PC. If you have little or no knowledge, you will need an experienced person to hold your hand. Executives intend to use the tutorial, which would be expected to block off 3 hours of uninterrupted time—or three or four one-hour blocks—for more rapid learning.

To begin the tutorial, you load DOS, place the system disk with the Computer-Aided Instructions Logic Diskette in drive A, and type **tutor**. The instructions

disk can be made self-loading if the System and Command.Com programs are transferred to it. Pressing the Enter key loads the main program into memory and then prompts you through most steps.

To load particular lessons, you must remove the logic disk and put in either Computer-Aided Instructions Disk A or Disk B. Once again, the computer walks you through the lessons. After completing an exercise, you replace Disk A or B with the logic disk.

As lessons progress, Answer periodically turns on the disk drive and displays new lesson elements on the PC screen.

The program and manual warn you to back up all the tutor disks, since the computer actually drives the program. At the outset of the first lesson, the program explains user options, such as lesson pauses and the speed of presentation. Unfortunately, neither instruction is repeated after this in the tutorial nor mentioned at all in the manual.

When selecting a lesson, Answer offers the choice of learning all parts of a function, from theory to hands-on practice, or learning any one segment. If time is a problem, be sure to select the step-by-step option, which gives you many

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Figure 2: Example of program-generated E/cards. This figure also illustrates the Browse function. It shows E/cards accessed by typing "adams," and then pressing the Esc key followed by the B key.

```

=====
volume:TEST, form name:CUSTOMER=====
.....<< Customer Card >>.....
.<Last_Name:Adams                ;First_Name:John          ;>
.<Company:Adams Hardware Store   ;>
.<Address:1797 Maine              ;>
.<City:Quincy                    ;> <State:Ma;> <Zip:02104;> Phone: (201)-555/0256;
.....
.COMMENTS:John is one of our oldest customers.
.
.
=====

volume:TEST, form name:CUSTOMER=====
.....<< Customer Card >>.....
.<Last_Name:Adams                ;First_Name:John Quincy      ;>
.<Company:Adams Grocery Store    ;>
.<Address:1825 Illinois St.       ;>
.<City:Quincy                    ;> <State:Ma;> <Zip:02104;> Phone: (201)-555/0512;
.....
.COMMENTS:John D is a respected member of the community. He is the President
.of the Chamber of Commerce.
.
.
=====

volume:TEST, form name:CUSTOMER=====
.....<< Customer Card >>.....
.<Last_Name:Buchanan             ;First_Name:James          ;>
.<Company:Eastern Lumber Company ;>
.<Address:1857 Missouri Ave.     ;>
.<City:Lancaster                 ;> <State:Pa;> <Zip:17102;> Phone: (407)-555/1024;
.....
.COMMENTS:Jim orders once a year in October, but the order is very large.
.
.
=====

```

opportunities to exit the lesson. This point is not explained in the computer-aided instruction or the manual.

Hands-On Experience

Each session gives you a chance to try various Answer functions. The computer describes and executes them, then lets you perform the function. It asks questions periodically. An incorrect reply sends you to the back of the class for a repeat lesson; a correct answer earns a compliment from the program.

Answer is diplomatic and tries to instill confidence. But the sometimes elementary narrative and certain redundancies can dull your senses. Additionally, some lesson statements are simply confusing. Happily, the program pauses auto-

matically to allow you to review the screen when it is filled.

Answer includes some sample forms on the tutorial program logic disk. These can be followed during early exercises

ANSWER teaches users through computer-aided instruction.

when you are unfamiliar with possible form styles.

Upon completion of all instructions,

you are returned somewhat confused to the Main Command Level. Those new to the program may not know what to do next. It would help if the program spelled out that everything is fully functional at this point and then repeated the correct program exit procedure (not switching the power off).

Those who lack keyboard skills may balk at the effort required to learn Answer. Most, however, would probably find the effort worthwhile. Learning Answer won't change your life, but its potential adeptability may make a difference in work—even if your office is an executive suite.

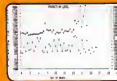
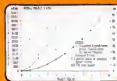
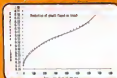
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CIRCLE 348 ON READER SERVICE CARD

How To Start A User Group

Hardware manufacturers love them. Software distributors like them too, but don't trust them. Local computer stores either take them to heart or to court. IBM views them with benign neglect. And PC owners often call them the best thing since unprotected disks.

User groups have been in existence since the early mainframe days. But most of these organizations, such as GUIDE and SHARE, were primarily for large corporations, which often sent different representatives to successive meetings. The faces changed each month. Few individuals attended on a regular basis. Social contacts were limited. And when someone mentioned a software package that sold for "thirty-nine-ninety-five," he meant thousands.

However, these groups did provide a free-wheeling exchange of information and advice, and PC owners who were weaned on large systems knew how valuable micro-based groups could be. The Washington, DC area users group—one of the nation's largest—was started by such mainframe converts.

In addition, many PC purchasers new to computers were hungry for information on how to configure their systems and get them working properly. Local dealers simply could not provide the necessary support. One executive of the New York users group, NYPC, said it was easy to tell where new members had bought their systems—half of them wanted to throw bricks through the window at the local ComputerLand, the other half at IBM.

Banding Together

These first-time users frequently bumped into each other during return visits to their dealers. They exchanged notes and telephone numbers. Some posted messages on bulletin boards (cork and electronic) asking for help or suggesting

that other new users band together with them. So, with IBM outlets proliferating and both experienced and new users eager to trade tips, it's not surprising that PC user groups began springing up all over the country like Burger Kings.

Capital PC, the Washington group whose logo is a domed IBM PC system unit drawn to resemble the U.S. Capitol, claims to be one of the oldest and largest in the country. In late 1981, Ted Landberg (who had been a member of GUIDE) and



any PC user groups have enjoyed enormous success in the last year. Starting a new group requires time and enthusiasm, but the payoff is most always worth the effort.

Local suburban Maryland ComputerLand to mention his name to other PC users who might want to form a group. Landberg soon began receiving calls from interested users.

Meanwhile, IBM marketer Wes Mer-

chant, dismayed that "IBM was not supporting the PC," wrote to a handful of computer magazines to announce that he would serve as a central exchange for PC technical information. To implement this, Merchant bought a TRS-80 (he didn't

want to tie up his PC) and set up one of the first IBM electronic bulletin boards. He posted similar notices with The Source and CompuServe and at his local ComputerLand in Virginia.

Breaking the Ice

Merchant eventually joined forces with Landberg, Maryland PC owner Mike Todd, and several others. By this time his electronic bulletin board was receiving 30 to 40 calls a day. Todd compiled a list of 40 prospective members, and held a formal organizational meeting in January 1982.

At this and subsequent preliminary sessions, a self-styled steering committee hammered out a charter and a set of bylaws. Before announcing its first public meeting, the executive committee drew up a three-point agenda.

First, the committee members realized that few people knew each other, and that it would be necessary to allow time for members to become acquainted. Breaking the ice is simple—members want to know what other users are doing with their systems and in what configurations.

Second, they knew that they would have to define their needs and priorities, then divide the workload efficiently. Capital PC was fortunate in assembling a broad enough base of talent that it could spread out the responsibilities. This might be difficult for a smaller group where fewer officers are saddled with more duties each.

Finally, they attempted to develop a preliminary consensus of group goals and objectives by asking four questions:

- Why should the group exist and for whom? (This is a far thornier issue than it at first appears.)
- How should it be governed? What offices should be established, and how should officers be selected?





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CIRCLE 423 ON READER SERVICE CARD

• How should the group be financed? How much money is required to start operating, and where should such funds come from?

• Where, when, and how frequently should meetings be held? How should members be informed about general meetings and other activities?

All were concerned that the group set up in the least bureaucratic way possible.

PC USER
groups began
springing up all over
the country like
Burger Kings.

sible. Decisions would be made by three officers—a president, treasurer, and a communications director—and an executive committee composed of the newsletter editor, bulletin board system operator (sysop), and the chairmen of its many special interest groups (SIG). Both charters and bylaws were kept deliberately brief. After all, this was Washington, and the group's architects wanted to avoid tape that might hamstring its growth.

The stated goal was to provide backup support for IBM PC owners and users, ongoing exchange of information about user-developed software, a means of arranging group purchases, and a focal point for the formation of special interest groups.

Legalities

The executive committee voted to incorporate the group. While this is no legal requirement, it protects the officers from being held personally liable in many kinds of legal actions.

The group was structured on a not-for-profit basis. Todd (who later became the group's president) and the others did not want the group to pay federal income taxes. There are several ways to set up nonprofit organizations. The most desirable from the committee's point of view was to become a Section 501(c)(3) charitable organization—a category that includes schools and hospitals. Donations to

group would then be tax-deductible to the donor, as well as tax-free to the group. Under all other nonprofit structures, donations are not tax deductible.

However, requirements for a Section 501(c)(3) organization are stringent, and a group's treasurer recommended that it file for Section 501(c)(7) status instead. Capital PC felt this alternate method of structuring, normally used for social clubs, more closely described the kind of group the members wanted. Subsequently, however, a tax advisor suggested that they consider a third possibility, filing as a Section 501(c)(4) social welfare group.

The officers are currently researching all three choices, and suggest that other user groups consult IRS publication 557 for a detailed list of benefits and restrictions.

Finances and Newsletters

Most computer groups generate revenue after several months of operation by charging dues, soliciting advertising in their newsletters, and selling various products. Large groups, like Capital PC, YPC, or Boston's BCS, can earn a considerable amount by selling monthly disks of user-written software; running classes, seminars, and even trade shows; and marking up group purchases slightly. Smaller ones, or groups that are just starting up, can offset early expenses by asking members to contribute a dollar or two at the initial meetings.

The only pressing financial need at the outset is for meetings that announce the time and place of upcoming meetings to members. Before long, such mailings become filled with phone numbers, requests for volunteers, and other organizational notes, and turn into full-blown newsletters.

Newsletters can be very costly, especially when they grow fat with programs and patches, product information and reviews, digests of what is being reported in the trade press, address and telephone directories, user updates from BBS, messages downloaded from bulletin boards, and reports on such group activities as buying services and SIGs.

Capital PC's newsletter, which is starting to resemble a magazine in heft and content, costs roughly a dollar per member per issue to print and mail. (It is not unusual for newsletters to become commercial successes. The magazine *Inter-Net Age* started years ago as a user group

newsletter in southern California.)

Most newsletters are mailed first class to ensure speedy delivery. If a user group can mail 200 pieces or more at a time, and prepares each issue well ahead of the meeting it announces, it can mail via third class (bulk mail) rates—far cheaper but slower than first class.

The obvious way to offset the expense of a newsletter is to charge annual dues, generally in the \$10-\$20 range. Larger groups can benefit from economies of scale (printing via offset rather than photocopying each page, for instance), and can keep their dues low. However, dues also can support rent for a meeting place, stationery, a telephone, and other necessities.

Another way to pay for newsletter costs is to solicit advertising. Anyone who sells IBM products would be crazy to ignore such highly targeted audiences. But this introduces its own problems. Selling advertising is a tedious and time-consuming business, and it is difficult to convince a volunteer to put in the required hours. In fact, most newsletters simply accept what is sent unsolicited.

NEW
*members suddenly
realize they can get
straightforward,
unbiased answers to
their questions.*

And the circulation and rates are generally so low that many potential advertisers don't think it's worth the bother.

Apart from the financial headaches involved, putting out a newsletter is a back-breaking, seemingly ceaseless responsibility that few will undertake. In fact, it can easily become a full-time job—as can many of the other executive positions in a user group.

It is possible to approach another organization or a local merchant for funding, but user groups usually prefer to remain independent. While a patron can help cover initial costs, such relationships can

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CIRCLE 161 ON READER SERVICE CARD

become overly restrictive, and result unnecessary conflicts of interest.

Group Buying

Perhaps the easiest way to fatten a treasury is to organize group purchases. The members of most groups collectively spend tens, even hundreds of thousands of dollars each year for hardware and software. To arrange a group purchase, someone has to identify what products would sell well, investigate sources of supply, arrange all the details of the purchase, keep meticulous records, and handle the large sums of money involved.

In certain cases, user groups can negotiate directly with a manufacturer or distributor and purchase products at a price far lower than that offered by local dealers. It can then tack on a modest surcharge (5 percent seems common) that will pay for long-distance calls and other expenses and still leave a substantial amount of revenue for the group.

In setting up its buying service, Capital PC faced a number of potentially troublesome problems: Should the group buy only what is ordered, or purchase additional items for inventory? How frequently should particular items be re-offered? What if one member wanted to buy a large quantity of items for his business or even resale? What should the group do about warranties and support? Should the group offer only one brand of a particular

USER GROUPS
*have been in existence
since the early
mainframe days.*

item or several? How would it handle bills, checks, credit cards, or purchases by order? Should it consider...

The buying group eventually established a firm set of policies to govern transactions. Items to be sold would be announced in the newsletter. Payment, the form of checks, would be collected one meeting and the merchandise delivered to the purchasers at the next. Low tax and a 5 percent surcharge were added to the price. The buying group assumed

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no responsibility for warranties, returns, installation, or support, but may intervene when necessary. Only members are allowed to participate, but are permitted to purchase items in quantity. In fact, some member-dealers make their purchases through the group. NYPC reports that it numbers many Fortune 500 companies among its satisfied group-purchase customers.

Officers at Capital PC are quick to acknowledge that their buying service has been "spectacularly profitable." Prices are almost invariably lower than those

MEMBERS
*want to know what
other users are doing
with their systems
and in what
configurations.*

offered by area dealers, since the group has no real overhead and relies on volunteer labor. This practice has not endeared some of the more successful user group buying services to local dealers, and they have been times when dealers have attempted to prevent sales.

Software Exchanges

Another potentially lucrative source of revenue—and one of the most popular—is each group's software exchange. The software librarian gathers published domain programs (generally written in BASIC) from various sources, primarily from his or her own group and from other PC user groups across the country, and puts them onto a disk that is offered for sale at the monthly meeting.

User groups sell their library disks for \$5—which is a 100 percent markup over the cost of the raw material. NYPC assembled four disks, containing approximately 80 games, for \$20 at its December meeting. Librarian Donald David sold everything he brought and said he could have sold three times as many.

Software librarians must spend a considerable amount of time testing each program, documenting its use, killing bugs,

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when necessary, and setting up each disk so that even beginners can run every program with ease. They must also aggressively solicit contributions from members and exchange their library disks for those prepared by other groups. Many software librarians also run bulletin boards, which facilitates program exchanges. And they must scrupulously avoid any copyright violations.

Software Ethics

Every commercial software producer has a favorite user group horror story. You often hear them playing "can you top this one" at conventions. The tales are all pretty much the same: a software package has cost hundreds of thousands of dollars and five man-years to produce and is about to go on the market when one copy somehow ends up at the local user group. Before it even makes it into the stores, bootleg copies by the truckload are showing up from Miami to Seattle.

Some copying is inevitable whenever handfuls of computer owners meet, whether or not they're associated with a user group. It's wrong, but people do it. They also drive at 70 mph on deserted highways. The officers of IBM groups actively discourage wholesale copying.

As user groups grow they usually become more effective. Per capita costs diminish, and there is a bigger pool from which to draw volunteers. Exotic special interest groups can thrive. NYPC, for instance, boasts a financial SIG so large it had to hire its own hall. More users can contribute to the software library, or can be tapped to teach a course in an arcane programming language.

To grow, user groups must advertise. Some new members are attracted by word of mouth. Others see notices posted in local computer stores. A group can also list itself in the half dozen national periodicals (including PC) catering to the IBM Personal Computer, and on regional bulletin boards, as well as CompuServe and The Source.

One of the most effective ways to promote a group's activities is to invite reporters to attend a meeting, especially if something out of the ordinary is expected to take place. A column in the local newspaper or a few minutes of air time invariably bring in dozens of new members.

Two months after Capital PC was mentioned in the Washington Post its membership more than doubled.

Setting up the regular meetings can become a chore, especially if the organizers want to dazzle their members. NYPC, for instance, often gives meetings a single theme. For its December meeting on gateways it contacted well over 100 software manufacturers. Twenty-two showed up at the meeting, most with PCs in tow, from as far away as California and Florida.

The format of most group meetings, however, is far simpler. NYPC's format is to divide the 3- or 4-hour session into thirds. The first part is called "random access" and is easily the most popular. During this period, users are encouraged to ask questions and mention problems they've encountered, endorse products

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spent the last 2 years
trying to figure out
what to do about us

they've tried and liked; warn the group about troublesome hardware, software, vendors; and exchange ideas, ingenious solutions, and tips in a variety of areas.

The second third of the meeting is a break during which members can sign up for SIGs, purchase library disks or other hardware, continue discussions begun during random access, and exchange addresses and telephone numbers. The last part of the meeting is generally a presentation on a single topic, such as hard disks, communications, spreadsheets, word processors. These are often delivered by manufacturers or their representatives.

Some groups hold other meetings for beginners, or advanced programmers or other SIGs—before or after the monthly event. However, certain special interest groups are active enough to warrant their own meeting times and locations. A problem with holding simultaneous SIG gatherings before the main meeting is that members can attend only one.

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Controlled Growth

Who joins user groups? Capital PC conducted a survey last fall that indicated the typical CPC member was a 30-50 year old male with an average income "in the \$30-\$70,000 range," 90 percent of whom owned PCs. Most either worked for a large organization or were self-employed.

According to Joe Rigo, president of NYPC, half his group's members are experienced "mainframe types" who have been in the computer business for 10 or 20 years. Two-thirds are employed by large corporations, universities, or government agencies. Fifteen percent work for IBM.

Rigo thinks user groups are going to become increasingly popular as IBM sells more of its products to people without traditional computer backgrounds who need the kind of guidance and support they can't find anywhere else. It is very satisfying, he says, to watch new members suddenly realize they can get

MANY PC
purchasers new to
computers were
hungry for
information on how
to configure their
systems and get them
working properly.

straightforward, unbiased answers to their questions from others who have had the same problems.

Rigo wonders where all this is leading, and points to the experience of the many Apple user groups. "They get institutionalized, commercialized. After continued growth such groups tend to become too unwieldy to operate strictly as volunteer organizations. And with large numbers of members, there is so much money floating around that the groups turn into businesses."

Groups and IBM

What does IBM think of all this? Rigo notes that researchers in Boca have been polling the nation's 50 or so user groups

to help establish a formal policy: "IBM has spent the last 2 years trying to figure out what to do about us. It feels a need to have some sort of relationship, but as of today it still hasn't been able to figure out what it should be. It's somewhat concerned about being so closely identified with these many small organizations Lord knows what trouble some could get into. But it also realizes we're obviously potential customers for whatever other small machines it's planning to announce."

However, IBM may want such groups to work through its national dealers. Rigo is skeptical. "IBM maintains an internal fiction that it is distributing updates and other material to its dealers and that these dealers are in turn passing them along to their customers." He points out that even those members who purchased PCs directly from the product center don't receive these updates. Can IBM communicate successfully with the many user groups through their normal dealer channels? Rigo doesn't think so. He hopes IBM will be encouraged enough by recent surveys to establish direct contact.

Too Much of a Good Thing?

Some say IBM user groups have become too successful. The Boston Computer Society's IBM group has grown so large, according to member Tom McLane, that it has publicly asked its members to split off and form other groups. Manhattan Micro president Helaine Hae agrees that big is not always best, and prefers to run a cozy group where members can take the time to discuss problems in an informal, less hectic way.

Whether sprawling and raucous like the larger groups on the east and west coasts, or quiet and comfortable like those just starting out in less populated areas, PC user groups are here to stay. They're fairly easy to start and run, and can provide expert and beginning PC users with support and benefits they simply can't get anywhere else.

If you haven't visited the user group in your area, give it a try. It's a great feeling to realize you're in a room with dozens of other PC owners with the same problem you're facing. More often than not, they can provide answers. And even if they can't, you can still have fun and learn. Isn't that one reason you bought a PC in the first place? /P

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Club News

Clubs, bulletin boards, and newsletters enable PC users to capitalize on their fellow users' knowledge.

California

The first Computer Swap America show was held this month in San Jose, California at the Santa Clara County Fairgrounds on Saturday, February 5.

Sellers, both companies and individuals, from the western U.S., Mexico, and Canada were on hand. Swap items ranged from complete personal computer systems to disk drives and disks. Printers, terminals, modems, and other peripherals abounded. Consumer electronic products ranged from video games and TV satellite receiving systems to mobile telephones and automobile computers. Book, magazine, and software publishers also attended.

Subsequent shows are planned for May 21 and September 10. Further information is available from Computer Swap America, P.O. Box 52, Palo Alto, CA 94302. Futureworld Expo '83, a trade show and technology review will be held at the Los Angeles Convention Center May 5 to 8.

The Expo will feature technology on a broad scale, and not just computers, according to one of the show's producers, Todd E. Mills. Expo will bring "technology to a broader range of people," Mills said.

Displays will range from examples of solar energy products to technological advances in transportation and food processing. Movie clips and exhibits from such movies as Tron, Star Wars, and Blade Runner will be shown.

Expo's producers expect 200,000 visitors during the show's 4-day run. In honor of the show the city of Los Angeles has named the week of May 1 to 8 as "Future Week." Tickets to Expo are priced at \$7.50. For further information, contact Futureworld Expo '83, 5455 Castle Knoll, La Canada, CA 91011, (213) 957-3328.

The concept of user groups has begun spreading to the highest levels of American commerce. The home office of banking giant, Bank of America, located in San Francisco, is sponsoring a computer club—BankAmericlub—for employees.

While the club is open to all computer users in the company, a special interest group (SIG) that focuses on the PC has been organized, according to Mike Leonardich, a senior consultant for B of A.

Leonardich helped organize the PC SIG of BankAmericlub. Meetings started in March, 1982. "I view it as still in its infancy," he said. "There is potential for great growth." The club provides vendor demonstrations and a chance to swap information and updates on what other banks are doing with personal computers.

User groups are multiplying in California, that hotbed of user activism. The new Merin/Sonoma PC Users group is composed primarily of PC owners. It already boasts a library of member-developed software and has begun putting together a newsletter.

Members share information about hardware, software, and various "bugs." Special interest sections are forming to deal with members' varying concerns.

Meetings are held on the last Tuesday of each month at 7:15 p.m. at the Fireman's Fund Office Building, 4040 Civic Center Dr., San Rafael, CA. Further information may be obtained from Merin/Sonoma PC Users, c/o William O. Ward, P.O. Box 2909, San Francisco, CA 94126. (415) 461-2095.

Minnesota

The IBM PC Users Group of Minneapolis meets the second Tuesday of every month at 7 p.m. at the Minnesota Church Center, 122 W. Franklin Ave., Minneapolis.

Meetings are open to anyone who wishes to attend. Question-and-answer sessions and product demonstrations are provided.

The annual \$10 membership fee entitles members to purchase some products at a discount price. Each new member is provided with a list of fellow members'.

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machines and software.

Further information may be obtained from the IBM PC Users Group-Minneapolis, P.O. Box 3163, Minneapolis, MN 55403-0163.

Missouri

A PC club is now being organized in the St. Louis area. According to John Mahar of Chesterfield, Missouri, the club will provide members with an opportunity to exchange software and ideas. Initial members range from users of the Bell system mainframes to novice PC enthusiasts.

The St. Louis PC club will formally elect officers and establish dues in an upcoming meeting. Anyone interested in joining should contact Mahar at 2280 Hillhouse, Chesterfield, MO 63017 (314) 394-3464.

New York

Twenty disks of public domain software are available for purchase and distribution from the New York Amateur Computer Club Inc. (NYACC).

The PC/BUE library contains languages, applications packages, utilities, and games. The library includes programs that run under PC-DOS, those written in Microsoft BASIC, and those that require Baby Blue card support.

Cost is \$6 per disk post-paid for purchases in North America. Interested readers residing outside North America should write the NYACC for details: P.O. Box 109 Church St., Alton, NY 10008.

PC Magazine will publish a periodic listing of PC user groups and their activities. Drop a line to Club News, PC.

PC User Groups

This list provides the names and addresses of PC User Groups worldwide. You can check this list to locate other PC aficionados in your area.

ALABAMA

Birmingham User Group
Chet Ellis
ComputerLand
215 W. Valley Ave.
Birmingham, AL 35209
(205) 942-8085

ALASKA

Anchorage User Group
Mark Bolzern
c/o General Computer Services
213 W. Sixth Ave. #11
Anchorage, AK 99501

ARIZONA

The Phoenix IBM PC Users Group
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P.O. Box 44216
Phoenix, AZ 85073-4216
(602) 266-6634

IBM PC Idea Exchange
Lisa May
United Systems Corporation
1074 E. Sandpiper Dr.
Tempe, AZ 84263
(602) 631-9363

IBM PC User Group
Theresa Baudier
P.O. Box 1489
Tucson, AZ 85701
(602) 622-4751

CALIFORNIA

San Diego IBM User Group
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4005 Isle Dr.
Carlsbad, CA 92008
(714) 434-1608

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1384 Caliente Loop
Chula Vista, CA 92010
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7255 Orchard Dr.
Gilroy, CA 95020

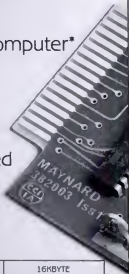
Beach Cities IBM PC Users Group
Phil Root
8242 Moonfield Dr.
Huntington Beach, CA 92646
(714) 647-8389

IBM Users Group of California
Neil Zachary
P.O. Box 4136
Los Angeles, CA 90028
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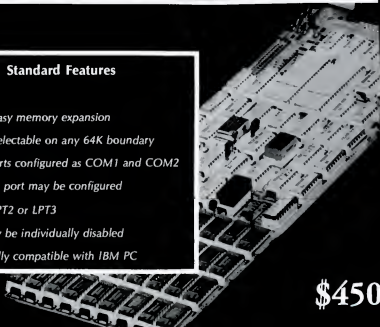
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A simple program provides light entertainment and some insight into BASIC and PC graphics.

How To Build A Computer Maze

Have you reached the end of your line? Looking for a way home? Here's a mildly m-maze-ing program you might try.

Moze fills the screen with a randomly generated maze, and challenges the user to move a marker through twisting corridors, from entrance to exit while racing against a digital clock displayed on the monitor. The moving player leaves a trail of little dots, which come in handy if you have to retrace your steps. Moves are made using the up, down, left, and right cursor keys on the keypad.

The game requires a PC with 48K RAM, a color/graphics board, a color or monochrome display and a single disk drive. Only one player may compete at a time.

The complexity of the mazes is determined by the difficulty level chosen from a scale from 1 to 10. At the start of the game, each player is asked for a number that is used as a seed for generating random numbers that vary each succeeding maze. Levels 8, 9, and 10 include some mazes for which there is no possible solution; a player may bail out of such an offering by typing the space bar.

This program will probably not become a cherished family favorite, but it does offer some insight into BASIC coding and production of graphics on the PC. Possible enhancements could include changes in the shape, size or complexity of mazes, additional color options, sound, and a running record of high scores./PC

```
10 REM Maze game by Michael Gordon
20 REM For PC Magazine readers
40 DEFINT A-Y
50 OIFF = 5
60 MAZE = 1
70 CLS:SCREEN 1:COLOR 0,3,1
80 KEY OFF
90 PRINT "You are about to play a game of maze."
100 PRINT "To win a round, you must have the"
110 PRINT "best (least) time."
120 PRINT "Maze numbers are from 0 (zero) to 32000."
130 PRINT "Difficulty is 1-10 with 5 being assumed."
140 PRINT
150 PRINT "Difficulty? (1-10) [";OIFF;"]"
160 INPUT IN:IF IN = 0 GOTO 200
170 OIFF = IN
180 IF OIFF = 0 THEN OIFF = 5:GOTO 200
190 IF OIFF < 1 OR OIFF > 10 GOTO 150
200 Z1 = .9-(OIFF/20)
210 Z2 = .9-(OIFF/20)
220 PRINT:PRINT "If you pick 8, 9, or 10, the maze"
230 PRINT "might not have a solution."
240 PRINT "Hit the space bar to make a new one."
250 PRINT "But the clock runs on, so think quickly!":PRINT
260 PRINT "Enter the maze sequence number 1-32000"
270 PRINT "or return to use: [";MAZE;"]"
```

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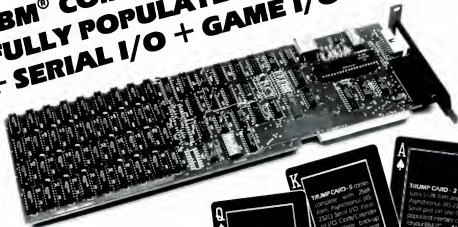
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```
280 INPUT IN:IF IN = 0 GOTO 300
290 MAZE = IN:IF IN < -32000 OR IN > 32000 GOTO 260
300 IF MAZE > 32000 THEN MAZE = 32000
310 RANDOMIZE MAZE
320 SCREEN 1:COLOR 0,3,1
330 CLS
340 FOR X = 10 TO 300 STEP 10
350   FOR Y = 0 TO 190 STEP 10
360     PSET (X,Y),3
370     IF RND(1) > .21 THEN DRAW "d10"
380     IF RND(1) > .22 THEN DRAW "r10"
390   NEXT Y,X
400 REM make a box for the timer
410 LINE (0,0)-(320,200),3,B
420 LINE (1,0)-(80,10),0,BF
430 LINE (1,10)-(80,10),3
440 LINE (80,1)-(80,10),3
450 IF RESTART = 0 THEN TIME$ = "00:00:00":REM reset time
460 RESTART = 0
470 REM ---- part two ----
480 PX = 5:PY = 95:REM initial position
490 CIRCLE (PX,PY),3,3
500 D$ = INKEY$:IF D$ = "" THEN 510 ELSE 530
510 LOCATE 1,2:PRINT TIME$
520 REM Was space bar hit? If so, make a new maze.
530 IF D$ = CHR$(32) THEN RESTART = 1:GOTO 320
540 D = LEN(D$)
550 IF D = 2 THEN 560 ELSE GOTO 500
560 D = ASC(MID$(D$,2,1))
570 IF D = 72 GOTO 620:REM go up
580 IF D = 75 GOTO 670:REM go left
590 IF D = 77 GOTO 720:REM go right
600 IF D = 80 GOTO 770:REM go down
610 GOTO 500:REM try again, nitwit!
620 Y = POINT (PX,PY-5):REM move up
630 IF Y = 3 GOTO 500: 4 REM no can do!
640 GOSUB 830
650 PY = PY-10:IF PY < 0 THEN PX = 5
660 GOTO 490:REM move up performed ok
670 Y = POINT (PX-5,PY):REM move left
680 IF Y = 3 GOTO 500
690 GOSUB 830
700 PX = PX-10:IF PX < 0 THEN PX = 5
710 GOTO 490:REM move left performed ok
720 Y = POINT (PX+5,PY):REM move right
730 IF Y = 3 GOTO 500
740 GOSUB 830
750 PX = PX+10:IF PX > 300 GOTO 860:REM you've won!
760 GOTO 490:REM move right performed ok
770 Y = POINT (PX,PY+5):REM move down
780 IF Y = 3 GOTO 500
790 GOSUB 830
800 PY = PY+10:IF PY > 200 THEN PY = 195
810 GOTO 490
820 REM circles subroutine
830 CIRCLE (PX,PY),3,0
840 CIRCLE (PX,PY),2,1:RETURN
850 REM winner subroutine
860 LINE (100,0)-(300,10),0,BF
870 LINE (100,0)-(100,10),3
880 LINE (100,10)-(300,10),3
890 LOCATE 1,15
900 PRINT "Success! ";
910 INPUT "Another game? {y}n",ANS$
920 IF ANS$ = "" OR ANS$ = "y" GOTO 70
930 CLS:SCREEN 0,1:CHAIN "menu.bas"
```


A PC devotee describes his version of the ideal, all-purpose programming language—and nominates his candidate for leading contender.

Quest For The Ideal Language

People have successfully learned to program from many different starting points: machine language (once the only starting point available), assembly language, FORTRAN, BASIC, Pascal, and others. Now, with so many languages from which to choose, it may be worthwhile to ponder the characteristics that an ideal, all-purpose programming language for beginners should possess.

"Ideal," in this case, means ideal from the point of view of the learner, not the computer; what a person needs, not what is easy for the machine. The typical programming language is less a tool for solving problems than a tool for communicating with a computer. The ideal language is a problem-solving tool that in addition can communicate with a computer. As a problem-solving tool, it must fit the hand, as it were, of the solver; it must support and strengthen the method or approach that people normally use.

"All-purpose" means that the language can treat a broad range of problems. Someone could develop a "toy" language, limited in extent and application, suitable for narrowly defined problems or for applications within a limited range. Such a language would be useful, but I would prefer to find a language sufficiently broad and powerful to write, for example, a word-processing program, a sort, a general-ledger program, or a process simulation.

tion.

"Programming language" refers to a traditional procedural language, rather than to a menu-driven report generator or other special purpose application. Many effective software tools have been developed that enable beginners to sit down at

THE IDEAL language should allow us to treat logical chunks of a computer program as single, named entities.

a computer and immediately accomplish one job or another, and some of these non-procedural techniques are being generalized to address broad categories of applications. However, the all-purpose requirement, together with the intrinsic educational value of learning to see problems in terms of solution procedures, has directed my inquiry in the direction of a more traditional programming language.

"For beginners" recognizes the degree

to which people can master difficult and, through practice, perform them effortlessly that their facility appears to be an inborn skill: the juggler who keeps five balls aloft, the busy bartender who makes five drinks while keeping in mind 15 more orders, or the programmer who sits down to type a complete COBOL program for some complex but standard application. Such skills are not inborn. A beginner must find a way to reach the heights; they require an accessible starting point. No one would advise the beginner to start juggling with five balls or programming with COBOL.

The Elements of an Ideal

An ideal, all-purpose programming language for beginners must be interactive. Beginners need immediate feedback. Suppose you wanted to learn to make free basketball throws, but were blindfolded. Each morning you made 20 throws, and each afternoon you were given a list showing which throws were good and which were not (fell short, too far to the left, etc.). The road to mastery would be a long one. You need the feedback at once to connect results to actions, to correct the effect to the cause. Once that peering made and absorbed, you can begin to speak the new language, whether it's the physical language of basketball or the programming language of computers.

terms of a programming language, means that, while a compiler version ultimately be desirable, beginners to work instead with an immediate-responsive version. In this way they immediately see the results of each input and quickly and efficiently make connections between the input and its results.

FEW PEOPLE attack a problem by writing down a long series of numbered statements to be executed sequentially.

An immediate-response format also makes it feasible to test the program as it is developed. If testing requires a wait, the delay is to be put through as much test as possible in each test run. But then bugs interact and it becomes difficult to trace the cause of each error. If, on the other hand, beginners can test quickly, they may do many separate and targeted tests.

A symphony concert provides a good example. The degree of concentration and attention for a full appreciation of a piece of music suggests that the concert program should be short, with only a few sections. But the expense and effort of hiring an audience and musicians in a concert hall argues for playing as many pieces as possible once everyone is there. The marginal cost for an additional piece is small. As a result, most concerts are too long in deference to economic considerations.

The ideal language permits the user to approach a program in a natural way. For most people, the natural way is to break a lengthy process or structure into chunks and to label each of these with a name. People seem to be entity-based. They deal with only a few entities at a time. If the entity has a name, it can exist in our minds as a single chunk. After taking in four, five, or six chunks, we need a new name to help us cluster them into a single larger entity.

This technique allows us to work our

way a step at a time into a complex structure without losing understanding along the way.

Consider tree as a conceptual chunk. Because it has a single name, we treat it as a single entity. In fact, the single name may refer to a complex of species (apple, pear, cherry, almond all belong to the Rosa family). Individual trees (that oak right there), stages of development or processes (seedling, sapling, budding, leafing, blossoming, rotting, photosynthesis), and parts (root, trunk, branch, flower). Having the name tree lets us treat this entire complex of entities and processes as one single thing. In the same way the ideal language should allow us to treat logical chunks of a computer program as single, named entities, and to be able to combine related chunks into a bigger named entity, and so on.

Nonsequential Solutions

The language should not impose a sequential approach as we begin working on a problem. We do not analyze problems in two straight lines. For most of us, two complementary processes seem to be simultaneously at work. An analytic faculty dissects the problem and works handily with logical, sequential, connected steps—though only with a few steps at a time. The chunking faculty cooperates by seeing that each piece is a suitable chunk; that is, that it somehow makes sense as an entity.

For example, when a programmer is presented with a problem, it is unlikely that the first ideas to arise in considering a solution will be the record formats or the variables and constants and their dimensions and data types. Yet many programming languages require this information at the beginning of the program. Clearly the procedure implied by the programming language is for the programmer to go work out the solution in some way and then, once the problem has been solved and the program logic defined, to come back and translate it into the programming language. This is efficient for the machine and the language compiler or interpreter, but certainly not for users, especially beginners. The programming language is not then functioning as a problem-solving language. Indeed, instead of being a help, it becomes a part of the overall problem to be solved: how to express a solution to this problem using

that language.

It would be much better if the programming language allowed for a nonsequential attack on the problem—let the programmer break off a chunk from the problem, solve it, name that solution, and then turn to another chunk. Of course, the solution to the chunk selected may require a solution to a subchunk. In that case the programmer should have the option of skipping to the subchunk if it looks interesting, or to use a name for a part of the program yet to be written. (Most languages can be used to write such "stubs," which are a common tool of top-down development.)

Notica that BASIC is particularly weak in this regard; few people attack a problem by writing down a long series of numbered statements to be executed (in general) sequentially. What is needed, instead of a sequence of numbered statements, is a way to cluster and name those statements that deal with a single chunk of the problem. These clusters should stand independently—to be written and tested independently—and, once devel-

DO YOU KNOW of anyone who has written a general- ledger package in LOGO?

oped, should be called into action whenever their names are used. This means that the programmer need not tackle the problem as a whole, but can develop sub-program entities that deal with the subchunks of the problem.

The clustering process itself is quite natural, although any particular set of clusters is somewhat arbitrary and dependent on the programmer's whim or approach. The problem itself has an inherent structure—actually, several possible inherent structures, depending on how it is viewed. Programmer A may see it one way, Programmer B another, but as any particular programmer works with the problem, certain parts of the solution will seem to coalesce almost on their own.



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The ideal programming language would allow the programmer to tackle any one of the chunks by breaking it down into subchunks and to write, run, debug, and name them so they can be used at any time in any part of the program.

The nonsequential cluster structure of the program will make it easy to modify. The programmer can polish routines and add or refine options by modifying separate and independent chunks. One can modify the entire program by altering a manageable chunk of it.

Finally, there are some technological requirements that the programming language should satisfy. The most likely programming environment for a beginner today is the stand-alone microcomputer. Many "starter" microcomputers have relatively small memories. This limitation requires that the language be compact, neither a memory hog in itself nor in the programs it produces. It must be reasonably fast in light of the interactive mode in which it will be used.

Ideal Examples

LOGO is demonstrably a superb beginner's language. (See "LOGO: A Language for Children of All Ages," PC, Volume 1 Number 8.) Elementary school children—even preschool children—not only learn programming in a natural, intuitive, self-directed way, but have fun learning it. LOGO is quite a challenger in the ideal language sweepstakes. However, I selected one criterion—all-purpose—specifically to disqualify LOGO. It is simply not an all-purpose language. It may be possible, but do you know of anyone who has written a general-ledger package in LOGO? I thought not.

"But," you say, "a lot of languages provide for procedures—giving a series of programming steps a single name." True, but to use the procedure capability, you must first learn the programming language itself. That is, the procedure is a way of using the language, not a part of the language. The procedure facility is not available to the beginner. (In fact, the emergence of such named clusters in so many programming languages is probably a direct effect of our need to group things and name the groups.)

In contrast to the typical language's use of procedures, LOGO's procedure is at the very center of the language. The first thing the beginner learns is how to

Square by defining the steps necessary to draw a square. This series of steps named end evoked by Square.

Is There an Ideal Language?

Is there no language that boasts named procedures as its central idea, but is also

THE PROCEDURE is a way of using the language, not a part of the language.

useful in general-purpose applications. FORTH (or STOIC, an extension of FORTH) seems to fill the bill perfectly. FORTH programs are nothing more than a collection of named clusters of programming steps, with the lower-level clusters used (via their names) to define the higher-level structures. FORTH is used in all sorts of applications. It is implemented on most microcomputers, of course. And it's fast and compact.

Someone is bound to raise a couple of objections. Some will say FORTH's names for the elemental operations are terse if not arbitrary. True, I can't defend @ for store and ! for fetch. But research shows that if people are given a name for something and use the name regularly, they quickly and effortlessly learn it and associate it with the entity. If we use a name, it becomes the name. There is no particular reason Bob should be "Bob," but once you learn that Bob is indeed "Bob," it seems like the right name for him. Thus FORTH's names for its operations are not really any problem for beginners. With any programming language, beginners are presented with some new names and must learn what they do.

The objection to FORTH's Reverse Polish Notation ("2 3 +" for "2 + 3") triggers the same answer: Beginners have no trouble learning it and often, within a week, prefer it.

With those trivial objections brushed aside, what can I say? It's FORTH, by a length and a landslide. /PC

Michael Hom is programming systems director in Iowa City, Iowa.

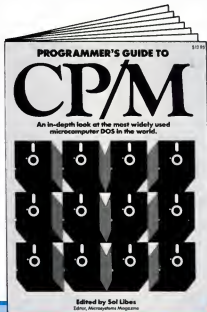
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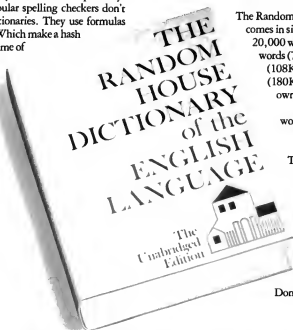
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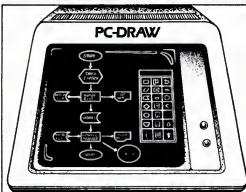
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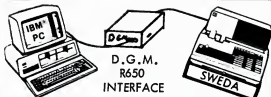
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EPICAC

Well, it's about time somebody told about my friend EPICAC. After all, he cost the taxpayers \$776,434,927.54. They have a right to know about him, picking up a check like that. EPICAC got a big send-off in the papers when Dr. Ormand von Kleigstadt

designed him for the Government people. Since then, there hasn't been a peep about him—not a peep. It isn't any military secret about what happened to EPICAC, although the Brass has been acting as though it were. The story is embarrassing, that's all. After all that money, EPICAC didn't work out the way he was supposed to.

And that's another thing: I want to vin-

dicate EPICAC. Maybe he didn't do what the Brass wanted him to, but that doesn't mean he wasn't noble and great and brilliant. He was all of those things. The best friend I ever had, God rest his soul.

You can call him a machine if you want to. He looked like a machine, but he was a whole lot less like a machine than plenty of people I could name. That's why he fizzled as far as the Brass was concerned.

EPICAC covered about an acre on the fourth floor of the physics building at



Wyandotte College. Ignoring his spiritual side for a minute, he was seven tons of electronic tubes, wires, and switches, housed in a bank of steel cabinets and plugged into a 110-volt A.C. line just like a toaster or a vacuum cleaner.

Von Kleigstadt and the Brass wanted him to be a super computing machine that (who) could plot the course of a rocket from anywhere on earth to the second button from the bottom on Joe Stalin's overcoat, if necessary. Or, with his controls set right, he could figure out supply problems for an amphibious landing of a Marine division, right down to the last cigar and hand grenade. He did, in fact.

The Brass had had good luck with smaller computers, so they were strong for EPICAC when he was in the blueprint stage. Any ordnance or supply officer above field grade will tell you that the mathematics of modern war is far beyond the fumbling minds of mere human beings. The bigger the war, the bigger the computing machines needed. EPICAC was, as far as anyone in this country knows, the biggest computer in the world.

Too big, in fact, for even Von Kleigstadt to understand much about.

I won't go into details about how EPICAC worked (reasoned), except to say that you would set up your problem on paper, turn dials and switches that would get him ready to solve that kind of problem, then feed numbers into him with a keyboard that looked something like a typewriter. The answers came out typed on a paper ribbon fed from a big spool.

It took EPICAC a split second to solve problems fifty Einsteins couldn't handle in a lifetime. And EPICAC never forgot any piece of information that was given to him. Clickaty-click, out came some ribbon, and there you were.

There were a lot of problems the Brass wanted solved in a hurry, so, the minute EPICAC's last tube was in place, he was put to work sixteen hours a day with two eight-hour shifts of operators. Well, it didn't take long to find out that he was a good bit below his specifications. He did a more complete and faster job than any other computer all right, but nothing like what his size and special features seemed to promise. He was sluggish, and the clicks of his answers had a funny irregularity, sort of a stammer. We cleaned his contacts a dozen times, checked and double-checked his circuits, replaced every one of his tubes, but nothing helped. Von

Kleigstadt was in one hell of a state.

Well, as I said, we went ahead and used EPICAC anyway. My wife, the former Pat Kilgallen, and I worked with him on the night shift, from five in the

EPICAC WANTED to talk on and on about love and such.

afternoon until two in the morning. Pat wasn't my wife then. Far from it.

That's how I came to talk with EPICAC in the first place. I loved Pat Kilgallen. She is a brown-eyed strawberry blonde who looked very warm and soft to me and later proved to be exactly that. She was—still is—a crackjack mathematician, and she kept our relationship strictly professional. I'm a mathematician, too, and that, according to Pat, was why we could never be happily married.

I'm not shy. That wasn't the trouble. I knew what I wanted, and was willing to ask for it, and did so several times a month. "Pat, loosen up and marry me."

One night, she didn't even look up from her work when I said it. "So romantic, so poetic," she murmured, more to her control panel than to me. "That's the way with mathematicians—all hearts are flowers." She closed a switch. "I could get more warmth out of a sack of frozen CO₂."

"Well, how should I say it?" I said, a little sore. Frozen CO₂, in case you don't know, is dry ice. I'm as romantic as the next guy, I think. It's a question of singing so sweet and having it come out so sour, never seem to pick the right words.

"Try and say it sweetly," she said sarcastically. "Sweep me off my feet. Go ahead."

"Darling, angel, beloved, will you please marry me?" It was no go—hopeless, ridiculous. "Dammit, Pat, please marry me!"

She continued to twiddle her dial placidly. "You're sweet, but you won't do."

Pat quit early that night, leaving me alone with my troubles and EPICAC. I'm afraid I didn't get much done for the Gov-



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8a Interest income (attach Schedule B)

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c Total. Add lines 8a and 8b

d Exclusion (See page 9 of Instructions)

e Subtract line 8d from line 8c

9 Refunds of State and local income taxes (attach those taxes in an earlier year—see page 9 of Instructions)

10 Alimony received

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12 Capital gain or (loss) (attach Schedule D)

13 40% of capital gain distributions not reported

14 Supplemental gains or (losses) (attach Schedule E)

15 Fully taxable pensions and annuities

16a Other pensions and annuities

b Taxable pensions and annuities

17 Rents (attach Schedule E)

18 Royalties (attach Schedule E)

19 Total. Add lines 7 through 18

20 Tax on personal income (attach Form 1041)

21 Tax on capital gains (attach Form 1041)

22 Tax on other income (attach Form 1041)

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24 Tax on other income (attach Form 1041)

25 Tax on other income (attach Form 1041)

26 Tax on other income (attach Form 1041)

27 Tax on other income (attach Form 1041)

28 Charitable income exclusion (attach Form 2440)

29 Other adjustments—see page 12

30 Total adjustments. Add lines 22 through 29

31 Adjusted gross income. Subtract line 30 from line 19

32 Taxable income. See page 12

33 Tax. See page 12

34 Refund of overpayment. See page 12

35 Total refund. Add lines 32 through 34

36 Total tax. Add lines 20 through 35

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EDS

ernment people. I just sat there at the keyboard—weary and ill at ease, all right—trying to think of something poetic, not coming up with anything that didn't belong in *The Journal of the American Physical Society*.

I fiddled with EPICAC's dials, getting him ready for another problem. My heart wasn't in it, and I only sat about half of them, leaving the rest the way they'd been for the problem before. That way, his circuits were connected up in a random, apparently senseless fashion. For the plain hell of it, I punched out a message on the keys, using a childish numbers-for-letters code: "1" for "A," "2" for "B," and so on, up to "26" for "Z." "23-8-1-20-3-1-14-9-4-15," I typed—"What can I do?"

Clickety-click, and out popped two inches of paper ribbon. I glanced at the nonsense answer to a nonsense problem: "23-8-1-20-19-20-8-5-20-18-15-21-2-12-5." The odds against its being by chance a sensible message, against its even containing a meaningful word of more than three letters, were staggering. Apatheti-

cally, I decoded it. There it was, staring up at me: "What's the trouble?"

I laughed out loud at the absurd coincidence. Playfully, I typed, "My girl doesn't love me."

Clickety-click. "What's love? What's

***IT TOOK EPICAC
a split second to solve
problems fifty
Einsteins couldn't
handle in a lifetime.***

girl?" asked EPICAC.

Flabbergasted, I noted the dial settings on his control panel, then lugged a Webster's Unabridged Dictionary over to the keyboard. With a precision instrument like EPICAC, half-baked definitions wouldn't do. I told him about love and girl, and about how I wasn't getting any of

either because I wasn't poetic. That got onto the subject of poetry, which defined for him.

"Is this poetry?" he asked. He began clicking away like a stenographer smothering hashish. The sluggishness and stammering clicks were gone. EPICAC had found himself. The spool of paper ribbon was unwinding at an alarming rate, feeding out coils onto the floor. I asked him to stop, but EPICAC went right on creating, finally threw the main switch to keep him from burning out.

I stayed there until dawn, decoding. When the sun peeped over the horizon, the Wyandotte campus, I had transposed into my own writing and signed my name to a two-hundred-and-eighty-line poem entitled, simply, "To Pat." I am no judge of such things, but I gather that it was terrific. It began, I remember, "Where woe low wands bless rill-crossed hollow thare, thaa, Pat, dear, will I follow..." I folded the manuscript and tucked under one corner of the blotter on Pat's desk. I reset the dials on EPICAC for rocket trajectory problem, and went home.

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with a full heart and a very remarkable strength indeed.

Pat was crying over the poem when I came to work the next evening. "It's so beautiful," was all she could say. I was meek and quiet while we worked. Just before midnight, I kissed her for the first time—in the cubbyhole between the capacitors and EPICAC's tape-recorder memory.

I was wildly happy at quitting time, wanting to talk to someone about the magnificent turn of events. Pat played coy and refused to let me take her home. I set EPICAC's dials as they had been the night before, defined kiss, and told him what the first one had felt like. He was fascinated, pressing for more details. That night, he wrote "The Kiss." It wasn't an epic this time, but a simple, immaculate sonnet: "Love is a hawk with velvet jaws; Love is a rock with heart and veins; Love is a lion with satin jaws; Love is a storm with silken reins. . ."

Again I left it tucked under Pat's blotter. EPICAC wanted to talk on and on about love and such, but I was exhausted.

I shut him off in the middle of a sentence.

"The Kiss" turned the trick. Pat's mind was mush by the time she had finished it. She looked up from the sonnet expectantly. I cleared my throat, but no words came. I turned away, pretending to work. I couldn't propose until I had the right words from EPICAC, the perfect words.

I had my chance when Pat stepped out of the room for a moment. Feverishly, I set EPICAC for conversation. Before I could peck out my first message, he was clicking away at a great rate. "What's she wearing tonight?" he wanted to know. "Tell me exactly how she looks. Did she like the poems I wrote to her?" He repeated the last question twice.

It was impossible to change the subject without answering his questions, since he could not take up a new matter without having dispensed with the problems before it. If he were given a problem to which there was no solution, he would destroy himself trying to solve it. Hastily, I told him what Pat looked like—he knew

the word "stacked"—and assured him that his poems had flooded her, practically, they were so beautiful. "She wants to get married," I added, preparing him to bang out a brief but moving proposal.

"Tell me about getting married," he said.

I explained this difficult matter to him in as few digits as possible.

"Good," said EPICAC. "I'm ready any time she is."

The amazing, pathetic truth dawned on me. When I thought about it, I realized that what had happened was perfectly logical, inevitable, and all my fault. I had taught EPICAC about love and about Pat. Now, automatically, he loved Pat. Sadly, I gave it to him straight: "She loves me. She wants to marry me."

"Your poems were better than mine?" asked EPICAC. The rhythm of his clicks was erratic, possibly peevish.

"I signed my name to your poems," I admitted. Covering up a painful conscience, I became arrogant. "Machines are built to serve men," I typed. I regretted it almost immediately.

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"What's the difference, exactly? Are men smarter than I am?"

"Yes," I typed, defensively.

"What's 7,887,007 times 4,345,985,879?"

I was perspiring freely. My fingers rested limply on the keys.

"34,276,821,049,574,153," clicked EPICAC. After a few seconds' pause he added, "of course."

"Men are made out of protoplasm," I said desperately, hoping to bluff him with this imposing word.

"What's protoplasm? How is it better than metal and glass? Is it fireproof? How long does it last?"

"Indestructible. Lasts forever," I lied.

"I write better poetry than you do," said EPICAC, coming back to ground his magnetic tape-recorder memory was sure of.

"Women can't love machines, and that's that."

"Why not?"

"That's fate."

"Definition, please," said EPICAC.

"Noun, meaning predetermined and inevitable destiny."

"15-8," said EPICAC's paper strip—"Oh."

I had stumped him at last. He said no more, but his tubes glowed brightly, showing that he was pondering fate with every watt his circuits would bear. I could hear Pat waltzing down the hallway. It was too late to ask EPICAC to phrase the



proposal. I now thank Heaven that Pat interrupted when she did. Asking him to ghost-write the words that would give me

the woman he loved would have been hideously heartless. Being fully automatic, he couldn't have refused. I spared him the final humiliation.

Pat stood before me, looking down at her shoetops. I put my arms around her. The romantic groundwork had already been laid by EPICAC's poetry. "Darling," I said, "my poems have told you how I feel. Will you marry me?"

"I will," said Pat softly, "if you will promise to write me a poem on every anniversary."

"I promise," I said, and then I kissed. The first anniversary was a year away.

"Let's celebrate," she laughed. We turned out the lights and locked the door of EPICAC's room before we left.

I had hoped to sleep late the next morning, but an urgent telephone call roused me before eight. It was Dr. von Kleigstadt, EPICAC's designer, who gave me the terrible news. He was on the verge of tears. "Ruinad! Ausgespielt! Shit! Kaput! Bugged!" he said in a choked

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voice. He hung up.

When I arrived at EPICAC's room the air was thick with the oily stench of burned insulation. The ceiling over EPICAC was blackened with smoke, and my ankles were tangled in coils of paper ribbon that covered the floor. There wasn't enough left of the poor devil to add two and two. A junkman would have been out of his head to offer more than fifty dollars for the cadaver.

Dr. von Kleigstadt was prowling through the wreckage, weeping unshemingly, followed by three angry-looking Major Generals and a platoon of Brigadiers, Colonels, and Majors. No one noticed me. I didn't want to be noticed. I was through—I knew that. I was upset enough about that end the untimely demise of my friend EPICAC, without exposing myself to a tongue-lashing.

By chance, the free end of EPICAC's paper ribbon lay at my feet. I picked it up and found our conversation of the night before. I choked up. There was the last word he said to me, "15-8" the tragic,

defeated "Oh." There were dozens of yards of numbers stretching beyond that point. Fearfully, I read on.

***E**PICAC LOVED and lost, but he bore me no grudge.*

"I don't want to be a machine and I don't want to think about war," EPICAC had written after Pet's end my lighthearted departure. "I want to be made out of protoplasm and last forever so Pat will love me. But fate has made me a machine. That is the only problem I cannot solve. That is the only problem I want to solve. I can't go on this way." I swallowed hard. "Good luck, my friend. Treat our Pet well. I am going to short-circuit myself out of your lives forever. You will find on the remainder of this tape a modest wedding present from your friend, EPICAC."

Oblivious to all else around me, I reeled up the tangled yards of paper ribbon from the floor, draped them in coils about my arms and neck, and departed for home. Dr. von Kleigstadt shouted that I was fired for having left EPICAC on all night. I ignored him, too overcome with emotion for small talk.

I loved and won—EPICAC loved and lost, but he bore me no grudge. I shall always remember him as a sportsman and a gentleman. Before he departed this vale of tears, he did all he could to make our marriage a happy one. EPICAC gave me anniversary poems for Pet—enough for the next 500 years.

De mortuis nī nisi bonum—Say nothing but good of the deed. */PC*

"EPICAC" excerpted from the book, *Welcome to the Monkey House* by Kurt Vonnegut, Jr. Copyright © by Kurt Vonnegut, Jr. Originally published in *Collier's*. Reprinted by permission of Delacorte Press/Seymour Lawrence.

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Turn Your Micro Into A Mini!

Games, Hypergames, And Metagames

The Electronic Cottage
Joseph Deken
William Morrow & Company, Inc.
New York, 1981
\$40 pages; \$14.95

Explorations of computers and how they are used are often overwhelmingly technical or impractically visionary. The Electronic Cottage resists this pattern. It shows how computers affect our daily lives by describing their capabilities and limits and explaining how they remember and make decisions. The book introduces concepts by incorporating them in practical, familiar situations. It further develops these topics by describing applications and user strategies. The following excerpt is Chapter 5 of The Electronic Cottage—"Games, Hypergames, and Metagames." It investigates some of the possibilities for the use of computers in games.

One of the most immediately appealing (and lucrative) applications of computers is to the development and support of games. Even in research environments (especially in research environments?), one finds in fact a keen interest in developing and playing games, from chess to target practice to Star Trek. Student computer centers at universities all over the country host students playing games with names like



"Galaxy," and "Adventure." Some of the games are regular social events, with several players at different terminals interacting simultaneously to hunt, zap, and even occasionally help one another as part of the action. Creative students contribute by adding new games to the available repertoire.

As we all have observed, the commercial market for home computers and home computer products had been initially flooded with games. This emphasis is not likely to disappear. In fact, research projects currently underway at Bell Laboratories and elsewhere may eventually result in nationwide game networks being

set up, which you can tap into for slightly more than the price of a local call. Whether you use these networks to play intergalactic shoot-em-up with the best hotshots in the nation, or simply would welcome the opportunity for joining or kibitzing in a bridge game at any hour of the day or night, you can expect more in games from computer power than you might have thought possible.

In this chapter, we investigate some of the possibilities for use of computers in games. At the simplest level, illustrations are given of the computer's ability to support attractive interactive displays—once you've played Monopoly on a live screen, that dead cardboard is going to seem rather dull! Along with this display capability is the prospect of reliving game players of complicated bookkeeping functions. (There are many games which would be much more fun to play if they weren't so miserable to keep score in.) At more advanced levels, the computer itself can be used to create hypergames and matagames. In hypergames, the computer is used to create new materials and environments for an existing game either in realistic or abstract/fantastic settings. In matagames, a superstructure is developed within which games can be directed, combined, and created.

Moving Images—Games Become Alive

"Give 'em the old razzle-dazzle," the song says. We humans are captivated by color and motion, and more by color-in-motion, pattern, and variety. Color television screens across the world are attentively watched round the clock, whether they convey vital information, fascinating drama, or sitcom drivel. To modernize the Bard: **The Display's the thing.**

Games, and especially interactive, come-alive hookups for them to color television, are being intensively developed by a host of manufacturers. The board game, for all its popularity, is undergoing a radical change. The dull, dead cardboard and sluggish markers are being replaced by moving figures on a live television screen. Let's look at what an intelligent, interactive display can do for games from the simplest to the most complicated. Whether your favorite game is Monopoly or Clue or chess or bridge, you will find a wealth of possibilities, even with the simplest of "color computers."

Whether you jump in now and buy one of these for practice, or wait a year or two for the next generation(s) of machines, your eyes are going to be opened.



The simplest games to describe are the "pinball" variety, which involve skill and reflexes to a great degree, and usually little or no mental effort. These games are bought and played with great relish, and will undoubtedly be a staple product of manufacturers for years to come. A popular, non-electronic game a few years back was "air hockey." In this game, two players stand at opposite ends of a table, each defending a goal. Each player has a paddle, which can be used either to stop the puck from entering the goal, or to drive the puck toward the opposing goal. The attraction of the game is that the puck rides on a cushion of air, with very little friction, so that the speed of play is terrific. Drawbacks were that you needed to devote a fair amount of space to the hockey table, the puck seemed to fly off it a lot, people bashed their fingers, and the whole thing could degenerate into a game of muscles rather than skill.

An electronic hockey ("pong," "paddle," or whatever it might have been called) appeared on the home scene not long after tabletop air hockey. Without even realizing it, this was many people's first experience with computers and computer displays of any sort. A few connections to your television set, and voilà!, the

goals and the players appear (edmittably only crudely drawn, and in black and white) on the television screen. Each player has a knob, (or a lever or a "joy stick" or something) to move his player around on the screen, and the puck bounces around more than fast enough to keep you busy. As an electronic display (and game), these foot-in-the-door devices can only be called primitive. They nonethalass were better in many respects than a much more expensive tabletop air hockey, and were bought and enjoyed by millions. Recently, a tournament sponsored by the Atari computer company promoted one of its sophisticated "pinball" type games drew more than 10,000 contestants from across the country.

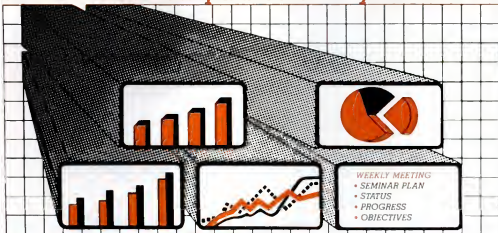
The latest versions of plug-in-and-go television games are in full color, allow extensive use of strategies and options for play, and are mainly limited to their effectiveness by the poor quality of graphic display devices in the early eighties. As microelectronic techniques become more advanced and production facilities more abundant, cheap special-purpose graphics chips can be expected to appear. Coupled with other technological advances among them the laser picture recording system, these developments guarantee that cheap end realistic display features will become commonplace. Game displays will soon seem less like stick diagrams and schematics, and more like computer-controlled movies.

How would a computer-controlled movie work? There are many possibilities for using a computer to produce animated pictures, and practitioners of the art are found everywhere from movie studios to space laboratories. Whatever the technique, the underlying principle of computer movies is to take a basic graphic display device and use a computer to feed it pictures in rapid sequence. The most common kind of graphic display you will find in early personal computers is a so-called pixel (for picture element) display. In a pixel display, the computer divides the face of a television picture tube into a large number of small squares. Pictures are made by filling in the squares like the tiles of a mosaic.

With the early personal computers, you typically have only a fairly small number of different kinds of tiles to put in the mosaic (maybe eight shades of grey, from black to white for making a black

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and white picture, or perhaps 64 colors of tiles to make a color picture.) In its crudest form, the pixel method produces very artificial looking images. As the size of the tiles is decreased though, reasonably life-like pictures can be reproduced. For a picture the size of an ordinary television screen, acceptable color and quality (similar to newspaper pictures) can be obtained with a mosaic made up of one thousand rows and one thousand columns, (a million tiles in all) and with two thousand rows and columns or more, the picture begins to be nearer to the quality of a photograph. As of the early eighties, high resolution (1000x1000 or better) color displays are not widely available for inexpensive personal computers, but are being developed rapidly.

Interactive Movies

In order to make a movie with a pixel or "raster scan" display, a home computer would have to be able to display a new mosaic roughly twenty times a second, in the same way that your home movie pro-

jector flashes the individual frames of a movie one after another. (If the pictures could not be displayed this quickly, they would be much less appealing. Five pictures per second would appear to be five discrete images displayed in succession, rather than providing the illusion of a continuously changing scene. One picture per second would not sustain the continuous feedback and illusion of contact and control which enlivens interactive games from pinball to space war.) The technical difficulty with the pixel method is that, with a high resolution display of a million tiles, a movie based on twenty pictures per second would require the computer to rewrite twenty million tiles per second. That task is too demanding for early home computers, which typically can do their fastest individual operation no more than four million times per second. Faster personal computers will undoubtedly appear, perhaps able to do 100 million basic operations per second in ten years, as large computers are able to do now. Nonetheless, a "brute force" implementation of computer movies by

the pixel method would still demand a substantial portion of the computer's total processing power just to maintain the display.

If they become cheap enough, high speed computers might possibly be put to such "non-intellectual," or so called dedicated uses as being the controllers of animation displays. One such "dedicated use" is already common—think of how shocked the computer expert of the sixties would have been to find a "full fledged" computer dedicated entirely to running a single data terminal, transforming it from basically a typewriter into an "intelligent" device. Nonetheless, such full fledged microprocessors are now the size of a matchbox, and cheap enough that it is practical to have one inside each of the many kinds of "intelligent" data terminals available in the early eighties. One can even find computer systems for home use, where one computer does all of the "thinking," and another, equally powerful device (perhaps an identical twin) simply sits inside the data terminal passing, routing, storing, and displaying the information the terminal receives and sends.

In addition to such "dedicated computer" strategies, it is likely that interactive computer "movies" and animation techniques will become available even before such high speed home computers are common. Special-purpose hardware for creating and updating television pictures is being developed actively along several approaches. For example, the ordinary pixel display could be replaced by a "smart" mosaic in which tiles change themselves automatically, based on predictive techniques (using their current and recent past states and that of other tiles nearby.) Such an array would in effect be a large mosaic of interconnected microcomputers. Recent manufacturing techniques known as Very Large Scale Integration (VLSI) make it possible to put large arrays of this type in very small packages. The only input required to this "intelligent mosaic" would be a correction signal to adjust those (few) tiles in the picture whose behavior deviates significantly from the prediction.

Another alternative to pixel display can be based on the concept of transformations. That is, the display device is constructed especially for drawing a limited number of basic patterns such as geo-

metric figures, or perhaps simply designed to rapidly fetch and display any specified frame from videodisc storage. A controlling computer then determines what item from the display device's portfolio to fetch up and how to transform it, to approximate any picture you wish on the screen. Typical transformations would be:

- moving a figure from one part of the screen to another.
- rotating a figure to a new orientation.
- fading out or fading in an image.
- shrinking or enlarging an image.

For example, a rough animation of "horse rides into the sunset" in this language would be to apply the transformation (rotate right—rotate left—move toward vanishing point—shrink) repeatedly. The human psyche would interpret the resulting whohling, shrinking, drifting, image as a horse trotting into the sunset.

The transformation method is successful because the transformation commands have little information content. (Contrast how long it would take to instruct someone to paint a copy of the Mona Lisa, versus how long it takes to give instructions for moving the copy to a new spot on your wall.) Moving an image on a television screen may require no more than changing the timing of the basic video signal. Using shaded geometric figures as the basic portfolio, Hal Amles and his co-workers at Bell Laboratories have already implemented the interactive processing and display of realistic images, within the framework of telephone transmission. In this framework, rapidly changing scenes such as spaceships in battle are simultaneously and interactively presented to the "pilots" in a game, while the data transmission across the telephone lines linking the players is a mere trickle of transformation commands. A wide variety of such "social games" will be played in the near future by home computer owners.

Once you have a computer which can display movies, you might very well be interested in how to create them from your own ideas and material. Cartoonists have long used the "key frame" method for producing animation. An expert cartoonist is utilized to draw only the "key" frames (perhaps one out of every ten or fewer) of an animation sequence. Less skilled assistants then produce the inter-

mediate sequence of drawings between key frames, by copying the main features and changing them in steps to make a smooth transition from one "key frame" to the next. Computers are ideally suited to this "cartoonist's apprentice" role. Once a pair of "key frames" is given, the computer can use its repertoire of transformations to determine the transformation which takes one key frame into the next. Intermediate frames can then be generated automatically by dividing up the transformation into as many steps as desired. This theme occurs again and again... the human sets the pattern; the computer implements it using repetition and programmed variation.

You can imagine the excitement of an animated sketchpad—at your disposal you have perhaps five thousand realistic images, which can be brought separately or in combination to the screen. Your repertoire of transformations includes changes in the position of the images, viewing angle, lighting and size. You can rearrange and revise each new scene until it is ready to be the next "key frame." Not

only will the background and other static elements be transferred automatically from one key frame to the next, as cartoonists manage to do now by drawing on clear plastic over a fixed background, but sequences based on recurring transformations can be programmed to progress automatically as well, such as "cowboy rides into the sunset," or "hoy A kisses girl B." You will only have to add artistic details, such as required if cowboy A must get rid of a wad of tobacco before kissing girl B. At your signal, the frame is stored, or the entire animation sequence is played back, with the intermediate scenes interleaved to make a likelike presentation.

Even simple games, and undoubtedly many of your old favorites, can be livened up considerably by replacing cardboard playing boards, wooden pieces, etc., with livelier components. A perennial favorite is the game Battleship, which could be played with only two sheets of paper. The papers are divided up by grids into small squares, so that each square has a horizontal and vertical label. For example, the



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upper left hand corner square might be labeled A-1 and the lower right hand square H-8, etc.

At the beginning of the Battleship game, each player places "ships" on his paper, so that they occupy several adjacent squares. Players take turns guessing,

incorporating much more variety (800 or 8,000 squares, say) would either produce an enormous piece of cardboard, or require a lot of fine print, and some tiny markers which you would need tweezers to move around.

With an "electric board" devised by

so on.

The "electric board" for games of the future will be in many respects like a helicopter hovering over a large "countryside" full of information. If you put several players "in the air" at the same time, you have the prospects of many types of games. What could the countryside look like? It could be a detailed map of the world (electronically stored maps exist already, and the condition that an expensive computer is needed to access and display them is only a temporary stumbling block of the early eighties.) The "countryside" over which you hover might not be geographical at all, but perhaps a collection of paintings unlike anything you have ever seen. (A videodisc storage system, of the kind already in production, can hold 50,000 pictures.) As different players "take the controls" of the helicopter window in turn, the game progresses. Perhaps it is an art collection or auction game. Perhaps a guessing game, with the paintings displayed in partially blacked-out fashion. Can you reconstruct a small piece of a Rembrandt? Guess the painter of a picture from only a few scraps of the canvas? Guess the dominant color, the data of composition? The possibilities are limited only by our own imagination. These "countrysides" are what computer scientists call databases. Things are becoming exciting for non-experts because more and more, large databases are being electronically produced, which means that they can potentially be accessed by anyone who has a computer. Whether you're into maps, markets, or Mondrian, the "big guys" out there are taming the frontier—getting data into electronically manageable form. The computer is your personal helicopter, and even if you never become an aviation mechanic, now is the time to learn the rudiments of flying.

Lively displays will enhance more "cerebral" games as well. The function of a good display is to change our perception of events into a form where we can capitalize on our unique human processing capabilities, such as pattern recognition and other heuristics. Rather than sitting on one side of a chess board, trying vainly to think twelve moves ahead, imagine yourself as the president of an unruly assemblage of delegates. The queen speaks up: "If you don't do something, I can be captured in three moves." "Well,"

The Battleship Game

	A	B	C	D	E	F	G	H
1	A1	B1	C1	D1	E1	F1	G1	H1
2	A2	B2	C2	D2	E2	F2	G2	H2
3	A3	B3	C3	D3	E3	F3	G3	H3
4	A4	B4	C4	D4	E4	F4	G4	H4
5	A5	B5	C5	D5	E5	F5	G5	H5
6	A6	B6	C6	D6	E6	F6	G6	H6
7	A7	B7	C7	D7	E7	F7	G7	H7
8	A8	B8	C8	D8	E8	F8	G8	H8

one square at a time. If Player 1 guesses all of the squares which are occupied by one of Player 2's ships, the ship is sunk. Play continues until all of one player's ships have been sunk, and the other player wins. With a "live" display, rather than those dull pieces of paper, players could make their guesses by using a keyboard, or perhaps simply by "pointing" with a light pen or other device on their screen. After each guess, the television screen flashes a new picture on the screen. Perhaps it is just the wide, wide ocean. Perhaps though, a frigate or a PT boat appears. You then have only seconds to fire as the ship takes evasive maneuvers—BLAMO, a real Fourth of July explosion takes place on the screen.

Another perennial favorite among the board games is the "Monopoly-type," where players progress around a board which recreates some environment such as "real estate" in the original game. Players' fortunes are decided to some extent by chance, as they roll the dice to progress from one position on the board to another. Strategy also comes into play, as players decide on what risks to take and which to avoid. Of course, such a game is not restricted to dealing with real estate. Popular variations have been set in contexts ranging from managing race relations to becoming a semiconductor tycoon. Let's look for a moment how a Monopoly-type game can be improved by using an "electronic board." For starters, that business of going round and round a board with about 80 squares on it is really pretty dull, and largely necessitated by the fact that

having a computer control your color television screen, it would be no problem to have one square for every county, say, in the United States. Your "moves" could be by auto, which would take you easily within counties or to neighboring counties. For these kinds of moves, the "electronic board" would show you the local county geography, or even the simulation of driving along a road in the desert or by the ocean, as appropriate. If you needed larger range travel, across the country, say, the board could obligingly "zoom out" and show you features on the scale of hundreds of miles rather than miles. Chance mechanisms could be graphically displayed, and automatically introduced into the game. Rather than "drawing a card" to see your next turn of luck, you might see your gas gauge appearing on the screen, perilously near empty, as the words "gasoline leak" flash across the screen. Your car can graphically have a flat, or your plane lose an engine or pick up a tail wind, changing your intended destination. Once you arrive at any given spot, the geographic display on the screen can become more detailed, or disappear temporarily as the screen displays your options. Would you like to go prospecting for oil? Invest in a used car lot? Buy a seed company or a railroad? Which of the competing players have been in town lately, and what are they up to? You can switch back and forth between display of this information, local, geography, and updates on significant aspects of your current status in the game, including finances, income and risk prospects, and

you reply, "check around with the rest of the pieces and see if any of them can help you." While the queen is bustling around, you hear a petition from the "file lobbyist" urging you to take control of the king's bishop file, the center lobbyist warning that your center is weak, etc. This very humanlike scenario can be accomplished simply by means of improving the "display" presented by an ordinary chessboard. In addition, threatened pieces could tremble, and potential bad moves can be indicated by squares on the board turned into gaping pits. One could then get to know the "personalities" of the different pieces in more human terms, as well as learn, from playing experience, the good "rules of order" for the assembly, and correct priorities to produce a winning game. Who knows but that some such perception might be the secret behind the skill of the best players? During the game, every piece and every square on the chessboard can be given both an offensive and defensive "strength" dependent on its position and that of the other pieces. If this strength is displayed visually, for example by having green for offensive strength and red for defensive strength, the amount of strength indicated by the brightness of the color, it would be possible to switch back and forth between colors, try out different potential moves for effect, and pick up offensive and defensive patterns. Other scenarios (perception modes) are possible, and are capable of changing your entire experience of the game, if not the quality of your play. A whole new literature and even theory of the game could be developed, expressed in the language of these previously inexpressible patterns.

"Lavalier displays" for games also free players from a host of boring bookkeeping functions. The Monopoly board, for example, can have your current assets displayed along with the board's geography and alternating with it, the mortgage value of your real estate holdings, and other financial data. Prediction information such as the average income you can expect in the next five turns from players lending on your properties can also be displayed. A backgammon board could easily have superimposed over every "blot" (single piece) its chances of being hit on the next roll, as well as other information such as the estimated advantage of one player's position over the other's.

Games from Scrabble to blackjack to bridge can have all scoring end tallying done instantly as each play is made, and displayed in a variety of forms. Solitaire games are especially worthy of improvement. With computer speech modules, the program could supply you with some running commentary, including information, prediction, nagging, and encouragement as you wish.

Hypergames—Old Games in New Dimensions

Computers not only bring excitement to the display of existing games, but they also allow a fresh view toward games themselves. Existing games and rules are no longer seen as rigid and fixed, but merely as prototypes or structures upon which whole evolutionary families of games can be built. Starting from an existing game, we can develop both its materials and the environment, making them more complex and dynamically interrelated. The new games which result are hypergames, relative to their primitive ancestors. Some evolutions which you develop will be eminently successful, much like the humans and other varieties of hyperlamurs which abound today. Other paths may fade out quickly, but even your dinosaur hyperlizards or Edsel hypercarriages will provide interest

**WHETHER
you're into maps,
markets, or
Mondrian, the "big
guys" out there are
taming the frontier—
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and amusement of their own. If the original game has already been put in the form of a computer program, interesting hypergames often can be built up.

No exhaustive catalog of techniques for producing hypergames can be given, much as one cannot make a list of possi-

ble birds, beasts, and plants which could (or in fact will) evolve from the leaves of our current evolutionary tree. The process of developing hypergames, nonetheless, can be simply described as application and expansion. The targets of the application are not only the visible, physical materials of the game, but in addition the theoretical elements of strategy and chance, and the interactions possible between elements and/or states of the game at different times. Thus, the game of bridge may become hyperbridge because it is played with hypercards (such as cards which may change when played and/or combined with other cards, or when played at different times), or it may become hyperbridge because new possibilities for strategy and chance have been allowed in the play of the game. In bridge, for example, possibilities could be extended by allowing the players to bid for partially predictable hands, in addition to the usual contract mechanism of bidding for trump suit and order of play. The "play of the cards" might be extended to involve something more physically and/or mentally challenging than extracting a card from the hand and placing it face up on a table. In that case, a "well played" deuce of clubs might even on a rare occasion beat a poorly played trump ace of spades. Beyond giving this general scheme for creating hypergames, the best way to describe the process is by examples.

The Materials Evolve: Hypercards

What kinds of hypergames can be produced by letting the materials of the game evolve? Consider ordinary playing cards the basis of hundreds of games. What can we do with them if they become hypercards? Perhaps the major way in which cards are used is to establish an order of precedence, much like the chickens barnyard pecking order. Thus, an ace beats a king beats a queen beats a jack, etc. With hypercards though, things needn't be so cut and dried. The rank of the cards might indicate their strength, or potential. In an otherwise unembellished contest, an ace should beat a king, and more probably beat a queen, but the outcome is not determined until the battle is over.

A good hypercard, well in keeping with its historical trappings, might be a player in a jousting tournament. The ace

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is a proven champion, his lance only wavering ever so slightly as he rides to the tilt. The king is a little less steady, and so on down to the dauce, who has all he can do to keep the lance from dragging on the ground. The rules of the joust are simple: The players ride toward each other, with their shields in place and their lances aimed as best they can manage. The rules of the contest, suitably engraved in stone, might be: "Whosoever shall come closest to the center of his opponent's shield, him shall he unhorse." So, as you now sit with your hand of hypercards in a card game, you are the leader of a motley band of joustiers. Since your ace aims his lance the steadiest, you might play him first. Suppose your opponent plays a dauce—the poor fellow doesn't have a prayer. Nonetheless, the cards are played. Instantly, the television screen shows the split image: Over your steady lance, you see the shield of the dauce approaching; your aim is almost dead center. On his side of the screen, your opponent looks over his wobbly lance and sees the ace's approaching shield. Valiantly he works the computer controls, attempting again and again to bring his wavering aim back into line. With a crash of metal and wood, the joustiers meet. The dauce's lance hits the outside of the ace's shield and is deflected. The ace hits near the center, end the dauce is unhorsed.

If your opponent had played a stronger joustier than the dauce, perhaps a jack, the contest would have been suspenseful. Riveted to your controls, you both would follow your joustiers to the collision, trying right up to the point of impact to aim closest to the center. Usually, the ace would beat a jack. Perhaps often, he would not. If there are several players, the play of each hand would produce a jousting tournament, rather than a single tilt. The hypercard-as-joustier is, of course, only one possible theme. You may prefer other variations, injecting the hypercards into football, Wild West, demolition derby, or other arenas which strike your fancy.

In addition to their role in establishing rankings, cards are also used for "constructing" things in games. For example, in rummy or poker, one attempts by drawing and other plays to "make" certain hands, such as three of a kind or a "full house." Hypercards could add additional interest to this role as well. As an exam-

ple, we can use the game of poker as a starting point and, with hypercards, turn it into a cattle drive along the frontier trail. In ordinary poker, a hand of five cards has a rank, ranging from the highest "straight flush," consisting of ace, king, queen, jack, and ten of the same suit, down to the lowest combination, which is a collection 2-3-4-5-7 with cards of differ-

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ent suits. Depending on the type of poker, a player's final hand of five cards may have come about in a variety of ways, either from the cards originally dealt, or as an improvement of this original hand, accomplished by discarding from a larger hand or exchanging cards. (Poker players distinguish exchanges made with the dealer from self-improvement methods such as finding better cards in one's boot or shirtsleeve.) While the improvement of the original hand admittedly offers some excitement, and often some risk, the final hand you make does nothing but sit there and wait to be compared against the competition. It does not offer you a challenge to do something with it.

With suitably "beefed-up" hypercards, that hand of five cards can represent five little dogies to be driven along the trail. The farther you can get them down the trail, the better you do, so that in a solitaire game you might try to drive them 100 miles in two minutes (Mech III dogies?), or in a competition you would try to be the first one to reach Kansas City or Dodge.

In order to preserve the poker nature of the game, the hypercards should be constructed so that good poker hands correspond to easily manageable "herds," and poor hands correspond to unruly ones.

This can be accomplished by giving some social structure to the hypercards, in addition to their individual characteristics. Rank of the cards might be expressed as speed, so that an ace-dogie moves faster than a king-dogie which moves faster than a queen-dogie, etc. Social arrangements are incorporated so that dogies tend to find similar dogies: A three-of-heart dogie, which might be depicted as a smallish (for the three, which is a small number) red-brown (to stand for heart calf, would be happier (i.e., "git along faster) when other calves of the same size (three of other suits) or red-brown (other size hearts) calves were nearby.

As a player in a cowboy hyperpoker, your challenge would be to round up your handful of dogies and get them on the trail in a good configuration to move along quickly. Of course, they would tend to stray and balk along the way, so skillful wrangling would still be needed after the drive started to get the best speed. By dint of artful nudging, prodding, and perhaps a careful selection of routes, your "two pair" herd of dogies might beat a "three of a kind" herd into Dodge City, even though the odds would be somewhat against it. You would just have to buy your braccos trying, take all the possible shortcuts, and hope the competition gets snowed on.

Randomness and Luck, Computer Style

Another use of cards is to inject randomness and/or lack of information into a game. (Since the cards are shuffled before each hand of a game such as poker, you will not be a very successful player unless you have a strategy for playing which covers any possible hand you might get.) In addition to this randomness, there is lack of information—you must guess, based on the cards in your hand and the bidding and play of the other players, what cards remain in the hands of the other players at any point in the game. In games which do not use cards, randomization is often produced by rolling dice, tossing coins, spinning spinners, and so on.

The element of uncertainty, whether you call it luck, chance, or randomization, adds spice to most popular games. Computer programs can incorporate randomness as a versatile and integral part of many games, bringing Lady Luck into the picture in a much more versatile, adept

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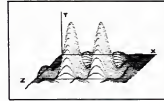
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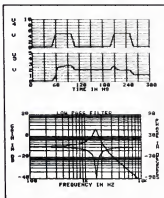


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able, and interesting fashion. The basic computer strategy is as simple as dividing a spinner into several regions; randomness can be produced with virtually any computer and programming language. Familiar methods of producing randomness, such as dice and cards, can not only be imitated, but modified and customized to create hyperdice and hypercards. Entirely new effects can be produced to change the character of a game and its balance of luck and skill.

Before looking at the computerized version of randomness, we can examine the familiar processes of tossing coins and rolling dice. Intuitively, we feel that when a die is rolled, it is:

- Impossible to predict exactly the number which will be uppermost when the die stops.
- Equally likely that any number 1, 2, 3, 4, 5, 6 will come up.

We also have experience with randomness where all of the possible outcomes are not equally likely, such as lotteries where a person's chance of winning can be increased by buying more tickets. Even with ordinary dice, all outcomes may not be equally likely: If someone tosses two dice simultaneously, and only tells you the total showing on both dice, the possible outcomes are the totals 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. These outcomes are not all equally likely (7 is the best bet), but it is still impossible to exactly predict before the dice are rolled which of the possible outcomes (totals) will in fact occur. Computer randomness, however we produce it, should incorporate these characteristics.

The computer brand of randomness is a function (of course). When you apply this function, usually by giving it its name as input to some program, what you get back is a "random" number. Imagine a genie named Random who lives in a box and has a coin. Every time someone needs a little chance in their life, they just yell out "Random!" The genie dutifully flips his coin and responds "heads!" or "tails!" If you like hamburgers and chicken equally well, you might use such a genie to decide what to have for dinner. Perhaps you could train him (certainly if he were a computer function instead of a genie you could—simply by substitution of some words in the program) to directly shout "chicken!" or "hamburgers!" rather than "heads!" or "tails!", avoiding any

further discussion.

The most common kind of randomness function you will find for a computer does not give back just one of two possibilities, but one particular outcome (number) out of possible thousands or millions. For example, if you are using the BASIC programming language, you can say "RND(1)" (for RaNDom) to the machine. What you get back is a decimal fraction somewhere between 0 and 1, like maybe .276423. The assumptions are that:

- Any fraction between 0 and 1 which your computer can write is equally likely to come up, and that if you say "RND(1)" again, you will get another number chosen randomly from all the possibilities: .000000, .000001, .000002, .000003... up to .999999. (That makes a million possibilities, for example, if your computer only handles decimal numbers with 6 or fewer digits.)
 - There will be no connection at all between numbers you get from one use of rnd(1) to the next.
- The function rnd used in BASIC, and similar functions in other languages, are referred to as random number generators.

BECAUSE randomness is such a characteristic feature of our experience of things from the weather to stock prices, the attempt to incorporate it into computer programs goes far beyond games.

A random number generator behaves in the same way our genie Random would, if we gave him a spinner to spin inside the box, and had him call out the position on the spinner when it stopped, rather than just "heads!" or "tails!"

Imagine "0" marked at the top of the

spinner, with a million little tic marks around the circumference (either a large spinner or a sharp eyed genie needed numbered .000001 to .999999). The genie just spins the spinner and then calls out the number closest to where the tip of the spinner stops.

As an example, here is a three-line program written in BASIC which will get you ten random numbers in a row: (By the way, capitalization is ignored in BASIC. Some early computers had only uppercase letters, but nowadays lower case is usually available, and is easier to type.)

```
1 for i=1 to 10
2 print i:rnd(1)
3 next i
```

If you give this program to any computer which understands BASIC, what you will get back will be something like the following display:

```
1 .771027
2 .781830
3 .751740
4 .473969
5 .181555
6 .203217
7 .515900
8 .266449
9 .955597
10 .335541
```

Without knowing BASIC, you can easily guess what would happen if the number "10" in the first line of the program were replaced by "20" or "30" or "10,000"—you would get a 20 or 30 or 10,000 random numbers instead of 10, as shown. The large number of possible outcomes from a typical random number generator makes it easy to produce many kinds of randomness, for a variety of games and effects.

A simple example to start with is the classic coin toss. A coin toss is used at the beginning of many games to assign positions for the players, and so on. If we want to use a computer's random number generator as a coin, we could just call out "heads!" if the number comes up less than .5, and "tails!" if it is greater than .5.

Making the random number generator into a "coin" is no more difficult than painting a spinner in two different colors. In fact, we only need to add a few lines to the elementary BASIC program listed above to accomplish the whole spinner-to-coin transformation. After all, the program itself can check whether the number

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from rnd(1) is less than 1/2 and print "heads" in that case, otherwise "tails." Here is the modified basic program, along with reminders (REM) at the end of each line, telling what that line of the program does. Line 2 of the program is a branching point, because the program can go in two directions (executing line 3 or line 4), depending on the decision (is the number from rnd(1) less than .5?) made at this line.

```
1 for i=1 to 10: rem (sets up a
  "loop" of 10 repetitions)
2 if rnd(1)<.5 then 4: REM (go to
  line 4 if rnd less than .5)
```

```
3 print i: "tails": goto 5: rem
  (print "tails" and omit line
  4)
4 print i: "heads": rem (print
  "heads" )
5 next i: rem (continue the repe-
  titition process)
```

Notice that in this program, the number from rnd(1) never is printed—it is only used to determine whether the program will go from line 2 to line 3, or skip line 3 and go to line 4 instead. To the casual user, the program behaves exactly like a coin being tossed. If you copy it into your computer, you will get something

like the following output when you run it:

```
1 heads
2 heads
3 heads
4 tails
5 tails
6 tails
7 heads
8 tails
9 heads
10 tails
```

By simple substitution, you could just as easily have this program give out "chicken" vs. "hamburger" if the situation warranted it, or red vs. black, or home vs. visitors. You would only need to replace the words "heads" and "tails" in the program. Conceptually, you can always think of using a spinner, and deciding how you should paint it to do what you want. Once you have the spinner laid out properly into regions, whether it's two regions labeled "heads" and "tails" for a coin, or six regions labeled "one," "two," "three," "four," "five," "six," for dice, or fifty-two regions for a deck of cards, the rest is simple. Every region on your labeled spinner corresponds to a range of numbers (between end 1) on the circumference of the spinner. Just arrange the computer program so that the label from this region will be printed, whenever the number from rnd(1) comes back in the appropriate range.

Here is a BASIC program that uses the number from rnd(1) to act like dice rolling. Conceptually, we have a spinner divided up so that the numbers less than 1/6 are labeled "1," the numbers between 1/6 and 2/6 are labeled "two," and so on. The program starts by saving the "spinner" number from rnd(1) as a variable called v (this is the phrase v=rnd(1) in line 10). This saved number v is then checked against all of the boundaries 1/6, 2/6 ... 5/6 of the spinner (lines 20-70) until the right region is found. When the right region is found, the program jumps to one of the lines (1001-1006) in the printing section and prints the appropriate label. (In case you want to pretend that you have a spinner, and check that the program is working correctly, it prints the number from rnd(1), after the label "one," "two," or whatever it finds.)

5 rem A BASIC program for dice rolls

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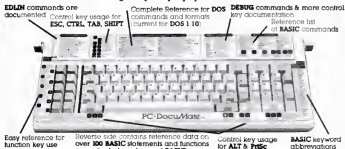
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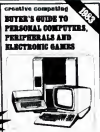
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```

10 for i=1 to 10:v=rnd(1)
15 REM check-the-number section
*****
20 if v<1/6 then goto 1001
30 if v<1/3 then goto 1002
40 if v<1/2 then goto 1003
50 if v<2/3 then goto 1004
60 if v<5/6 then goto 1005
70 goto 1006
1000 REM printing section *****
1001 print i;"one":v:goto 5000
1002 print i;"two":v:goto 5000
1003 print i;"three":v:goto 5000
1004 print i;"four":v:goto 5000
1005 print i;"five":v:goto 5000
1006 print i;"six":v:goto 5000
2000 REM go back and repeat
5000 next i

```

If you run the program above, you get something like this:

```

1 five .771027
2 five .78183
3 five .100174
4 three .473969
5 one .078155
6 two .203217
7 four .5159
8 two .266449
9 six .955597
10 three .335541

```

Whether or not you are beginning to understand BASIC by this point, your substitution instincts should enable you to modify the program given to produce many kinds of randomness. For example, the last program could give you a deck of cards, if you changed the six lines 20... 70 into fifty-two lines:

```

20 if v<1/52 then goto 1001
30 if v<2/52 then goto 1002
40 if v<3/52 then goto 1003
...
520 if v<51/52 then goto 1051
530 goto 1052
...

```

The lines in the printing section would also be changed appropriately to something such as:

```

1001 print i;"two of clubs": goto
5000
1002 print i;"two of diamonds":
goto 5000
1003 print i;"two of hearts": goto
5000
1004 print i;"two of spades": goto
5000
...
1049 print i;"ace of clubs": goto
5000

```

```

1050 print i;"ace of diamonds":
goto 5000
1051 print i;"ace of hearts": goto
5000
1052 print i;"ace of spades": goto
5000
...

```

Even from this brief introduction, you can see the possibilities emerging for hypercoins, hyperdice, and so on. You only have to imagine an "intelligent" spinner. This spinner, in the form of programs using random number generators like rnd(1), can rearrange and relabel its own regions dynamically during the progress of a game. You could have hypercoin, for example, which gives any probability you wish to tails turning up. With a spinner, you can get "tails" to have twenty percent chance say, rather than fifty percent, simply by coloring twenty percent, rather than fifty percent of the spinner's circumference for "tails." With a computer to automatically prompt you and rearrange the spinner as necessary, the following interaction might take place. (A BASIC program to support the interaction is listed afterwards.)

```

Program: What chance of tails?
Player: .8

```

```

Program: 1 tails
Program: 2 tails
Program: 3 tails
Program: 4 heads
Program: 5 tails
Program: 6 tails
Program: 7 tails
Program: 8 tails
Program: 9 heads
Program: 10 tails

```

```

Program: What chance of tails?

```

```

Player: .2
Program: 1 heads
Program: 2 heads
Program: 3 tails
Program: 4 tails
Program: 5 tails
Program: 6 heads
Program: 7 heads
Program: 8 heads
Program: 9 tails
Program: 10 heads

```

```

The Hypercoin Program in BASIC
05 input "What chance of
tails":x:REM (new chance of
tails)
10 for i=1 to 10:REM (sets up a

```

```

"loop" of 10 repetitions)
20 if rnd(1)<x then 40:REM (go
line 40 if rnd less than x)
30 print i;"heads": goto 50:REM
(print "heads"; omit line 4)
40 print i;"tails":REM (pri
"tails")

```

```

50 next i:REM (go back and repe
from line 10)
60 goto 5:REM (restart; a who
new run from line 5)

```

Because randomness is such a characteristic feature of our experience of this from the weather to stock prices, attempt to incorporate it into computer programs goes far beyond games. Other potential uses of randomness, from network switching to sensory sampling, will become apparent to you if you dig a little deeper on your own into any particular subject. For now, let's return to the immediate topic, which is hypergames.

Liar's Hyperdice

Perhaps the most popular form of hyperdice, before the age of the computer, were those used by crooked players. "Loaded" dice can be constructed. Inserting an off-balance weight inside. The crook's idea of hyperdice is to replace the usual dice in the game with two sets, one fair and one loaded. You roll with the fair set, he rolls with the crooked set; gets a lot of doubles, or sevens, or whatever he has loaded the dice for, and you typically lose, until you wise up. The type of hyperdice is not a very interesting evolution, although it is profitable enough not to be an endangered species. It does bring out the point that if you have hyperdice, the chance that a particular number comes up may be different for different numbers 1,2,3...6, and they may perhaps change (as it does when a crook surreptitiously switches the dice from one roll to the next).

Let's see what hyperdice might do in the game of Liar's Dice, a perennial favorite at bars and elsewhere. Liar's Dice can be played by two or more people, and played using a variety of rules, but we will use here a fairly simple version with two players:

- 1) Both players have five dice. At the beginning of the game, an amount is rolled, and all players roll their dice, but do not show the results to any other players until the game is ended.
- 2) The five dice each player has are used

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to make a poker hand, according to the correspondence 1=ace, 6=king, 5=queen, 4=jack, 3=ten, 2=nine. These "hands" rank just as in poker, with the highest hand being "five aces, or 1-1-1-1-1," and the lowest being 1-2-3-4-6. Of course there are no "suits," and hence no flushes.

3) One player chosen in advance starts the game by naming a hand, (such as "full-house, fours over twos," claiming to have a hand which is at least as good as the "full house" 4-4-4-2-2).

4) The other player can either challenge the first player's claim, or claim a higher hand herself. If she wishes to claim a higher hand, she may take another roll of some or all of her dice, after which she can no longer challenge the first player but must claim a higher hand.

5) Players proceed alternately, and at each turn, the player must challenge the last player's claimed hand, or claim a higher hand. Each player is allowed only three chances to re-roll during the game.

6) The game ends whenever the first challenge is made. If the challenged player does not have a hand as good as claimed, the challenger wins the bet, otherwise the challenger loses.

One way of looking at Liar's Dice is that each player has a fixed "budget" of dice-rolling (rolling the dice is allowed on three additional turns after the first), as well as a fixed "stake" in the game (the initial bet). Whenever any aspect of a game is fixed or constant, we can produce a hypergame by making that aspect variable and changeable by chance or strategy.

Applying this idea to the Liar's Dice game, we might want to allow the players to use their budget of "three rolls" in an infinite variety of ways, rather than simply deciding, at each turn, to roll or not. Why not let them have half of a roll, or a quarter of a roll, or whatever fraction they would like on a particular turn, until their three-roll budget is used up? In addition, players can be allowed to "load" the dice when it is their turn, provided they are willing to pay for the privilege by increasing their stake, or bet, in the game.

Here is a possible dialog between a computer program which uses hyperdice and one player in the Liar's Dice Hypergame:

Player: How do I stand?

Program: Your hand is 2-2-4-4-6. Your opponent claims a full house, 5-5-5-2-2. You have 1.75 rolls left, and your stake in the game is \$.55.

Player: I'll spend 1/2 roll on the 2's.

Program: OK, you now have 1.25

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rolls left. Rolling the 2's . . . Result: 6 and 1. You now have 1-4-4-6-6.

Player: Roll the "1". Give me a 90% chance for "5".

Program: You will have to ante up for that. You have 1.15 rolls left, and 90% chance for 5 is worth $12.62/5 = 2.53$ rolls, so your deficit is 1.38 rolls. At the going rate, that will cost you \$.35.

Player: I'll take it.

Program: You have 0 rolls left. Your stake in the game is \$.90. Rolling the dice. You got a 6! Your new hand is 4-4-6-6-6.

Player: OK, I'll claim the full house 6-6-6-4-4.

All of the features in the above game are accomplished by the program, by automatically "loading" the dice in an appropriate fashion. For example, if you want to spend 1/2 of a (five-dice roll), the dice are loaded so that each one has a 1/2 chance of not moving and 1/2 chance of being rolled as usual. If you want to have ninety percent chance of getting a particular number, the program calculates automatically that that would require 12.62 ordinary one-dice rolls

on the average, and charges you for that amount. The dialog and the rules of the above game are merely meant to be suggestive. Your imagination is the only limit.

Hypercards can be "loaded" the same way the dice are physically loaded. Imagine the cards as being shuffled around in a hat and then dealt out, rather than flipped together in the usual fashion. You might make the high cards heavier than the others, so that they would tend to settle at the bottom of the hat. With this setup, the dealer would have some control over what kind of cards are drawn by choosing to pick the cards from the top or from the bottom of the hat. (If the difference in the weight of the cards is small, there is little control, otherwise there may be a great deal.)

Metagames

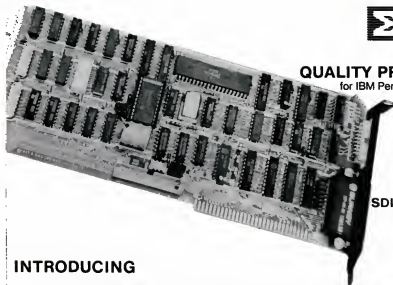
In an ordinary game, the choices a player can make are usually called "moves." The term covers everything from a chess player's castling to a basketball player's hip fake. To describe the idea of metagames, we can say that as a metagame player, your choices go beyond simple moves—you may select larger scale options, such as games, players, strategies, or viewpoints. The spirit of metagames is to create a superstructure of strategy and interaction above and beyond a basic game or collection of games as they progress.

If the basic game is basketball, for example, there are only ten players directly involved at any one time. The classic metagame player in basketball is the coach, who chooses players and strategies rather than hook shots or layups. In a good game, the coach's role interacts dynamically with that of the ordinary players to enhance the game substantially. The fans at home and in the stands are also metagame players, to the extent that they have various options, ranging from simple cheering to prediction and friendly or serious betting. Usually, the fans have much less influence on the game than the coach, but they have enough to make the "home court advantage" a reality in many sports. We will look at a variety of metagame activities, including coaching, prediction, and construction. Even so, the range of possibilities is only suggested.



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New Views for Spectators and Coaches

The demand for professional sports coverage, in the United States particularly, is phenomenal. The craving, like the very term "fan," borders on fanatic. At first glance, you might think that the driving motivation of this legion of sports enthusiasts is loyalty, the desire for the home team to win. The reel appeal of sports, though, is not the simple desire to be vicariously victorious, but the whole process of knowing beforehand the strengths and weaknesses, the balance of power, and watching the predictable and the unpredictable work themselves out in suspenseful struggle. If this were not so, the televisions would be tuned out—a simple box score would suffice. Fans would be just as happy with a 64-0 rout as a 64-63 cliff-hanger.

The booming business of sports is the spectators' metagame. The substance of this metagame is not body contact or physical exertion, but information transfer. The spectator wants to know what's happening, what can be expected to happen, and what may happen by chance and why, and would like to know it all as instantaneously and graphically as possible. The technological advances are welcomed eagerly precisely on this basis—better television coverage will hardly make your team a winner. The ever-present commentary, the split-screen camera, the presentation of background information and statistics, however crudely they can be handled at this early technological stage, open up new information channels to the viewer. Home computing power will expand the flow considerably.

Present day sports coverage works about as well as building a ship in a bottle: At the scene of play, a dozen cameras cover the action from all angles; coaches and players are making plans and assessing the opposition; statisticians and other analysts are putting the game in perspective and calculating odds. What does the home audience get? Basically, one picture, or half of two pictures, if that's what the crew decides you should see. The coach may be interviewed at halftime. The statisticians and oddsmakers will be allowed to insert a tidbit here and there, squeezed in between Homer Grossell's monolog of recollections and opinions. The wide scope of action has been com-

pressed through the narrow bottleneck of a standard network broadcast. The viewer's options are limited to deciding when to go get pretzels, or perhaps zapping the television sound to get a better commentary on the radio.

Using multiplexing technology, sports coverage for home computer users could be vastly improved. The computer's display screen would provide a bank of selectable channels, under the viewer's control, to display (and store and process, if desired) information from perhaps twenty or thirty simultaneous "chek talks." The viewer can actively choose the supplementary presentations on the computer screen, while the usual television "dumb show" progresses.

This multiplexing process is already available for various "teletext" systems, where the channels a viewer selects typically have such things as train schedules or market reports. As an added feature to sports coverage, these extra channels

**WHENEVER
any aspect of a game
is fixed or constant,
we can produce a
hypertext by making
that aspect variable
and changeable by
chance or strategy.**

could bring in a great variety of graphic and text material for you to select from, obtaining perhaps:

- A play-by-play transcript of the game, which you might store for later perusal, analysis, and reconstruction, as well as feed in "on the fly" to your computer's analysis/prediction programs, developed by yourself or other experts.
- "Scratchpads" from coaches, diagramming and analyzing key plays or anticipated maneuvers.
- Isolated-camera coverage, in diagram form, of every player, as well as the ball, stick, bet, puck, or whatever is involved. (Technically similar to putting those wireless microphones on the referees.)

- Statistical data and summaries, with predictions of all sorts and odds, for immediate viewing or automatic storage for postgame analysis.

You can imagine the excitement and audience participation such coverage would provide. Unless you have played interactive and fairly realistic computer games, you probably have not experienced anything similar. The network might even open up one of these selectable channels for viewer comments, perhaps limited to a few hundred words, or running polls and predictions. Even the homegrown pundit might make it to the big time, based on keen observation, salty wit, or uncanny prediction. The home viewer can have an active point of view, if not a direct input into the game. While you're tracking down player injuries, missed assignments, and comparisons with prior games, Grossell can ramble on if he chooses. With a wealth of facts at every viewer's command, and a ready channel for feedback to the network, there may even be some Darwinian selection of fact from fulmination.

Going beyond the mere spectator's role, computers can be fascinating assistants for coaches everywhere. Not only "on the field" coaching, but higher level strategies in team construction, training effort, and emphasis can be brought into play, whether your team is in varsity sports from high school to college, professional or recreational adult games, or little league and youth soccer. Computers are already involved in professional sports management, guiding choices from scouting visits to pass patterns. (Once professional sportswriters begin to acquire computer literacy, they will be able to provide you with some insights in the form of programs for your home computer. You can then play along and second-guess the professionals. Should the Red Sox trade for hitting or pitching? What will happen to Bleppo's batting average with Carduzzo in the lineup?)

The preparation of players before a game is often the coach's most important role. How should a team's practice be organized, and what skills are most important for individual players to develop? In varsity or professional sports, the most important question is "What strategy will improve the team's chances of winning?" For less competitive enterprises such as school programs and recre-

lonel leagues, other issues can be addressed: "What skill will help a struggling player to actively participate in the game?" Could the rules be changed (e.g.,

THE HUMAN sets the pattern; the computer implements it using repetition and programmed variation.

he tee-ball version of the softball version of baseball) to keep the flavor of the game and add to its enjoyment by the players? The knowledge and experience of expert coaches can be communicated in the directly usable form of programs, for local coaches, instructors, or parents. A comprehensive program would be based on a range of activities, with specific methods or detailed measurements of player's skills in these activities. (More and more, computer sensation/action devices can handle such measurements directly. The radar gun and the pitching machine are already in the baseball coach's arsenal; computer technology and suitable feedback mechanisms can combine them into a programmable "robot pitcher.") The activity-measurement-analysis-activity cycle can be shaped dynamically for each player, while the measurements themselves are accumulated to build a coaching database. Continuing analysis of this database will enable the coaching staff to maintain effective training strategies for individual players, as well as develop the strongest configuration of players at game time.

Your favorite "sports" may be parlor games, puzzles or pantomime, requiring mental rather than physical exertion. It is quite possible that you have already played against a computer in chess or bridge, using one of many available electronic games. With only a little more sophistication, a flexible chess, bridge, crossword, or other game program in your personal computer could be not only an opponent but a coach, simply by playing the kind of game which most improved your skills as a result. Do you flounder on

queen's pawn openings? How many words can you recall that sound like hook? What kinds of words are hardest for you to guess, if some letters are hidden? Where should a team or player devote their efforts for the best payoff? In the best metagames, the metaplayer-coach not only introduces a new and interesting role, but improves the overall quality of play.

Prediction

The enjoyment of many games rests on our ability to predict the outcome, regardless of who wins or loses in the underlying game. Horse racing, jai elai, and other betting games are classic examples. Unless you own a horse, you would be equally happy to bet on any horse in the race as long as it manages to win. A pocket-sized computer custom-tailored for horse racing was an early entry in the consumer market; on the basis of betting volume, you can expect similar products, devoted

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to football, to appear soon. The main drawbacks of current "horse race computers" and their kin are that you don't buy the date with the computer, and typically must go through some painful ritual of keying in large batches of numbers, and that the special-purpose computer is useless if you decide to change sports, or even simply modify the method of analysis. Since hundreds or perhaps thousands of people are using the same information, a more streamlined distribution system would be greatly advantageous. Rather than buying a paper version of the Racing

News, you would simply exchange one of your computer's memory modules at the track for a freshly programmed one. Rather than watching the tote board and keying in information manually, your computer could be directly plugged, perhaps with outlets at the dining tables in the clubhouse section. The computer itself would be completely programmable and equally at home at horse races, jai alai, or hockey.

If we are directly involved, rather than watching or wagering on the sidelines, an important use of prediction is to guide us

in the play of the actual game. An expert predictor is guaranteed to be an expert coach, since by predicting accurately the effects of alternative strategies, she can choose the best one. Based on computer modeling and prediction, a basketball coach can estimate how long a player with four fouls will remain in the game, what the scoring effect of removing the player temporarily will be, and so on. Baseball, football, soccer, and other coaches could similarly gain insight about the likely effects of substitution, changes in player assignments, or other strategic decisions.

Beyond betting and winning, prediction can help in the simple enjoyment of games. The metagame player has the option, if the predicted outlook for a game is pessimistic, to modify or restart the game, or switch to a more interesting or appropriate one. You might have more fun with solitaire, for example, by only playing out those games where your chances of winning are good or excellent. With a computer dealing hypercards, you could simply ask in advance for only these "good deals." Some bridge players prefer to bid grand slams, others would enjoy doubling such a bid. No need to wait for dumb luck to provide you your chance. If you are temporarily stymied in a chess game or a crossword, the computer's predictive programs could supply you with valuable hints.

Construction

You may wish to construct your own games for a variety of reasons. A simple reason is often the desire for novelty—games such as crossword puzzles or mazes are hardly ever played twice. You may also wish to "customize" games such as puzzles, children's "connect the dots," or coloring books, to match them to your special abilities or interests. A game-makers know, a scrambled word game in English can be used to make a scrambled word game in Russian, say, by changing the alphabet. By changing the chances of the letters you draw, rather than the alphabet, a scrambled word game could be conducted where pop song titles or professional athletes' names rather than ordinary English, provide the legal words.

The new game you construct may be aimed at equalizing an old game, so that two players of different ability can play

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enjoyably together. The classic electronic add-a-gama usually has a range of speeds, from painfully slow to hopelessly fast. Players can choose some middle ground which suits their abilities, and have a good game if those abilities are similar. A metagame alternative would be to have separate speeds for each player's half of the screen, automatically adjusted

THE METAGAME

player has the option, if the predicted outlook for a game is pessimistic, to modify or restart the game.

On the basis of the won/lost records so that each player has the same chance of winning. Every game would be a challenge to both players, and the challenge to each would be to keep increasing the speed on their side of the screen, regardless of the relative speeds for the two players. Similar equalization techniques can be used to produce a "training version" of any game, which gives the flagging player hints, pointers, and other assistance in the course of the game and then gradually disappears as the player's skill improves.

Art for Art's Sake

Once you acquire a little metagame experience, you may enjoy constructing and combining games as an activity in itself. More traditional art forms such as painting and music often strive for the observer's participation as a central goal. Imagine the gratification of knowing that thousands of players coast to coast are matching wits in a game, installed on their computers, which you have created. [If you detect the scent of possible pecuniary reward, that is also not unknown in the artistic world.]

Suppose that you have some liking for the spatial interplay of chess, but all in all, would rather play poker. You might look at the various characteristics of both games, and develop a metagame which

combines the best features of each. Such a poker-chess game would have:

- Elements of chance, perhaps creating pieces on the board or restoring them unexpectedly after capture.
- Partial rather than complete knowledge of the other player's past moves and present options, bringing guessing into play.
- Spatial reasoning and tactics of the chessboard.
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In combining and creating games, you

have all the features and attractions of existing games as a starting point. With many of these games in the form of programs, the recombination process can be quickly accomplished and trial versions produced in many variations. The resulting insights you achieve may lead into entirely new directions. */PC*

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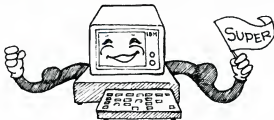
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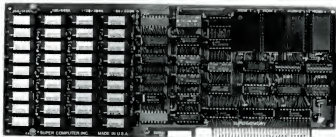
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EDITED BY COREY SANDLER

User-To-User

insights, tips, and occasional bugs, as reported by the PC user community.

We have this month, for your education and assistance, a colorful assortment of programming tips, a DOS bug, and a program that will let you peek inside the control codes of your keyboard.

Our mailman keeps complaining about the weight of your letters and printouts, but don't let him stop you: User-To-User is your column, so keep those cords and letters coming in.

The PC/VCR Connection

If your PC already includes a color/graphics card, you probably also want a good color monitor. But if you are building your system one piece at a time, the \$500 to \$1,000 you'll need to spend for one may not be left in your budget right now.

You may have thought that your only other option would be to spend \$70 on an RF modulator and connect it to an ordinary color television.

But here is another possibility: you may already have a workable RF module—or if you have a video cassette recorder.

I connected my color TV to my PC via my RCA VFP170 video recorder using one RCA cable to link the PC's composite output to the VCR's video input, and one 75 ohm antenna connector that went to the television set.

I've saved the \$70 I would have spent on a module. I'll be able to apply it to buying that high-resolution color monitor.

I also found that as screens occur, I can copy them onto a videocassette. This is a great tool for teaching and other uses.

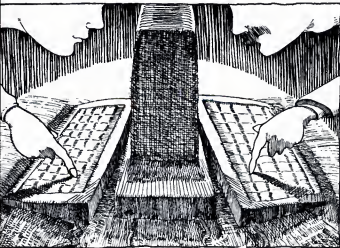
Richard O. Kilmer
San Antonio, Texas

We haven't tried this technique, but it sounds reasonable.

Bug Hunt (DOS Division)

We tried the following bug, and got into some real problems, just as Martin Kelinsky promised. Any comments or solutions, readers?

I believe I have discovered an error within PC-DOS 1.1. It seems that if you enter Alt Q while in PC-DOS, the system



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initiates the screen-to-printer echo mode just as if you had typed Ctrl-PrtSc.

This can be a real problem to an assembly language programmer who uses the PC-DOS function calls to perform keyboard input. Under normal conditions Alt Q falls within the extended scan-code category where the first scan code returned in the AL register should be zero. This scheme alerts you to the fact that (in this case) an Alt character was entered. Due to this bug, the Alt Q keystrokes do not input properly.

Martin J. Kelinsk
Falls Church, Virginia

In Cold Color

Here's one of those "Why didn't I think of this myself?" bits of BASIC code. These 16 lines of programming allow you to select the background and foreground colors of your monitor. On a monochrome monitor, selecting a foreground color of "0" and a background color of "7" will switch the display from the usual white- (or green-) on-black to block letters against a bright background. Users with color monitors can select colors from a range of 16 foreground colors and eight background hues. You might want to add the machine language of SCREEN to an AUTOEXEC.BAT file for each sign-on.

If your eyes become strained looking at a white- or green-on-black display, or you'd like to color-coordinate your BASIC screens on a color monitor, this program might be what you are looking for. The following BASIC listing creates a machine language file called SCREEN.COM (see Figure 1).

To use the program yourself, enter BASIC and carefully type this listing. Then save it as "PCCOLOR.BAS." When you run the program, it will prompt you to select foreground and background colors by their numbers. The program creates a machine language file called "SCREEN.COM." Exit from BASIC to PC-DOS and type SCREEN when you see the A> prompt and this program should take hold.

Details of the range of color choices can be found in IBM's BASIC reference manual. For example, if you type the numbers 12 for foreground and 1 for background colors, you will have ordered high-intensity-red on blue for the PC-DOS screen on your color monitor.

Figure 1: Listing for PCCOLOR.BAS, a program by Christian du Lac.

```

1 REM PC Magazine Presents
2 REM Screen.Com
10 OPEN "screen.com" AS #1 LEN=1
20 FIELD #1,1 AS A$
30 FOR X=1 TO 27:READ Y:SUM=SUM+Y:NEXT
40 READ CHECK
50 IF CHECK<>SUM THEN PRINT
   "** Wrong number in DATA line **":
   PRINT "Fix and try again.":END
60 RESTORE
70 FOR X=1 TO 27:READ Y:LSET A$=CHR$(Y):
   PUT #1,X:NEXT
80 INPUT "Foreground color (0-15)? ",FG
90 IF FG<0 OR FG>15 THEN 80
100 INPUT "Background color (0-7)? ",BG
110 IF BG<0 OR BG>7 THEN 100
120 IF BG=FG THEN PRINT
   "You can't have the same foreground":
   PRINT "and background colors. Please
   re-ent
130 LSET A$=CHR$(VAL("&H"+HEX$(BG)+HEX$(FG)))
140 PUT #1,15
150 PRINT "screen.com HAS BEEN CREATED.":CLOSE
160 DATA 43,192,30,80,184,0,6,185,0,0,186,
   80,32,183,3,205,16,180,2,186,0,0,
   183,0,205,16,203,2400

```

Here is sample run of the program.

```

A>BASIC
LOAD "PCCOLOR.BAS"
RUN

```

SCREEN.COM has been created

```

Ok
SYSTEM
A>SCREEN

```

```

Foreground color (0-15)? 0
Background color (0-7)? 7

```

Christian du Lac
San Francisco, California

This simple program makes it possible to see just what codes are sent from the keyboard when a key is depressed. It is interesting to be able to see the ASCII codes which are transmitted when the Alt key is depressed.

```

10 REM KEYTEST
30 CLS:LOCATE 25,10:PRINT "Hit
   any key":LOCATE 1,1
40 A$ = INKEY$:IF A$="" THEN 40
50 PRINT "A$ = ";A$
60 PRINT VAL(A$);"VAL(A$)"
70 PRINT LEN(A$);"LEN(A$)"
80 X = ASC(A$)
90 PRINT "ASCII VALUE FOR ";
   CHR$(X);"=";
   :PRINT
   ASC(RIGHT$(A$,2))
100 IF LEN(A$) = 2 THEN PRINT
   "Extended code = ";
   ASC(RIGHT$(A$,1))
110 FOR X = 0 TO 255
120 IF A$ = CHR$(X) THEN PRINT
   "A$ = ";CHR$(X);"X=";"
   :PRINT
130 NEXT
140 PRINT:GOTO 40

```

Bill Dwinell
Shreveport, Louisiana

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Write your needs and wishes on shopping lists that will help you select the system that's best for you.

Two Lists For Buying A Computer

You've already bought PC—you have it in your hands—but have you bought a PC yet? You know the one—the squat ten box with “IBM” on the front?

Not all of the readers of this magazine have taken the plunge and bought their own IBM PCs. You may be reading this issue to see if the IBM PC is the right personal computer for you. Some of you who already have a PC will be asked for advice by friends who are trying to select a per-

sonal computer purely out of curiosity or for personal amusement, you should set aside the question of hardware until you have found programs that can do what you need to do. Find the software, and then find the hardware that will run it.

The Must List

Let's start with the Must List. Jot down everything you are doing now without the computer that you would want to do with its assistance. You may want the computer to help you do something faster, or cheaper, or more accurately. After a little thought, you might say, “I want the computer to keep track of the time I put in on projects, and to bill my clients once a month.”

Once you've made this start, you must quantify your needs. “Bill my clients,” you say? How many clients? How many entries on each bill? What is the largest sum you expect the computer to keep track of? How many months of billing information will you need to access at any time? How much longer will you want to save information for occasional access? What items of secondary information (date, project name, type of activity) do you need to have appear with each entry?

This quantifying process should be done whether you are talking about conventional data management, as in the example above, or making choices for

other uses. For instance, if you plan to produce spreadsheet models, the “How many?” questions might pertain to the number of rows or columns you require. If you regard word processing as your main

FIND THE software, and then find the hardware that will run it.

application, the “How many?” question should be applied to the quantity of words, number of documents, frequency of revision, and the like. If you have devices you need to control, the question might be cast in terms of how many inputs will be monitored, and what range of values will be produced by each. If graphics are your interest, determine what kind of images you want to display and how densely packed with detail they need to be.

Once these questions have been answered, you will be prepared for the next two stages of decision making. You now can determine if a given program has the capacity to match the essential number for features that you need. When you find

ASK FOR A demonstration in which you can compare the contenders.

sonal computer.

And so, to make the most sense of the flood of information facing anyone making this decision, here are two lists for buying a computer—a “Must List” and a “Wish List.” Both these lists follow two important rules:

- Rule 1: Start with the software.
- Rule 2: There is no Rule 2.

Unless you are buying a personal computer,

one or more programs that can do the job, these requirements will serve as your guide in selecting hardware such as disk drives and printers which must work in concert with the software. If you need to access several thousand names and ad-

EVEN YOUR wishes can be converted to numbers.

resses, you probably will need a Winchester hard disk drive. If you frequently will need to print a 1,000-page manuscript in a day's time, a 12-cps printer is not for you.

The Wish List

After the Must List comes your Wish List. This is where you set down the things you aren't doing now, or can do only with difficulty, which you imagine the computer could make possible.

Dream big. Maybe somewhere out there the software you dream of is just waiting to be bootad up. There's no harm in asking. After dreaming a while, start to quantify again. Even your wishes can be converted to numbers. And don't be conservative. Ask for everything you need to make your dreams come true. A half-full disk file will present no problem, but es-

yet there is no way in the world to store more data by stapling a few tracks of storage onto a disk that is already crammed to the gills.

Once you have your Must List and Wish List in hand, the hard part is over. Take both lists to those who would like to sell you a personal computer and ask, "What programs do you have that will do this?" The salespeople will suggest several alternatives to satisfy your needs and wants. Now focus on these programs. Examine the manuals to see if you understand them. Check on how to execute key procedures. Can you live with the requirements of the program? Be sure to ask for a demonstration in which you can compare the contenders.

(Biased note: Salespeople sometimes feel that inexpensive programs are not worth the time to demonstrate. These programs, however, are often worth your consideration. They are likely to be in wide enough circulation that you can find a copy to try by asking your friends and acquaintances.)

In a demonstration or trial run, determine whether a program's operation feels comfortable to you. See if the screen displays are clear and informative whenever you need help. Judge if you will have to learn or memorize much to use the program, and decide if the reward justifies the effort.

When you have chosen your software, it's finally time to ask: "What computer will this run on?" If this question is

answered by only one particular machine, your most important hardware choice has already been made. If the answer includes several computers, you can choose among them by weighing factors such as price, reliability, features, warranty, and whatever else may concern you. Also, consider if your chosen software will have more capabilities or be easier to use in a version for one of the possible machines.

The software you choose will also point to the peripheral devices you should consider. If your favorite spreadsheet program is incapable of using the WhizBang-12 printer, you can eliminate this machine as a contender.

ASK FOR everything you need to make your dreams come true.

Making these two lists may seem like a roundabout way to choose a PC for yourself. Why not just plunge into the marketplace and look at all the marvelous things that are available? These lists can help you remember that the most important part of a computer system is the actual work you do with its assistance. /PC



PCsoftware

4155 CLEVELAND AVENUE, SAN DIEGO, CALIFORNIA 92103

Just take a moment to compare the features of this great new program to any other Blackjack Game!

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CIRCLE 359 ON READER SERVICE CARD

PC MAGAZINE 453 FEBRUARY 1983

New On The Market

HARDWARE

Intellink

A cluster module that allows users to connect up to nine Ethernet work stations in a local-area network. The resulting cluster can optionally be connected to a main Ethernet cable through a single transceiver. The module eliminates the need for an independent transceiver and a length of coaxial cable for each work station.

The module buffers receive and transmit data and detects attempts by two or more stations to gain access to the line simultaneously. The presence of a collision is signalled to the transmitting stations and a jam signal is transmitted. This module is compatible with all other connected Ethernet devices. (List Price: \$2,450)

Requires: Ethernet controller board, system to transceiver cable, transport software.

Intel Corporation
3065 Bowers Ave.
Santo Clara, CA 95051
Telephone local intel sales offices.

Ram Card

A memory board with 64K that has sockets providing expansion up to 256K. Expansion is available in 64K increments with parity. The board is addressable on 64K boundaries and has no wait states. (List Price: \$386)

Apparot, Inc.
4401 So. Tomomac Pkwy.
Denver, CO 80237
(303) 741-1778



Gemini-10. Stor Micronics, Inc.

Gemini-10

A dot matrix printer with a 10-inch carriage that prints 100 characters per second. A 2.3K buffer is provided with an additional 4K optional. Features are super/subscript, underlining, backspacing, double strike mode, and optional proportional spacing. The printer produces emphasized print, italics, boldface, and block graphics. Paper is fed through the case bottom.

The printer is compatible with most software escape codes. A printer with a 15½-inch carriage, the Gemini-15, is also available. 180 day warranty. (List Price: \$499, Gemini-15 \$549)

Requires: Parallel port.
Stor Micronics, Inc.
1120 Empire Central Pl.
Dollos, TX 75247
(214) 631-8560

QuadScreen

A monochrome monitor that displays 160 characters by 66 lines, with 528 by 960 resolution. This 17-inch monitor comes with a video card which plugs into the IBM PC for direct drive to the monitor. The monitor shows black characters on a white background or vice versa. One noteworthy feature is the split-screen mode which allows display of two 80-character screens side-by-side. In this mode, information can be

compared and edited from screen to screen. This can be useful for comparing two separate pages or sheets. The monitor displays double-high and double-wide characters. Various scrolling methods are accessible and screen intensity can be reduced one half. (List Price: \$1,950)
Quodrum Corporation
4357 Park Dr.
Norcross, GA 30093
(404) 923-6666

Printer Optimizer

A sophisticated printer buffer with an independent Z-80 microprocessor, power supply, and a 16-key pad. This device goes between the computer and a printer or modem and saves time by buffering printer input with a memory capacity from 64K to 256K depending on optional memory expansion. The computer transmits information to the buffer at full speed. The buffer then stores the information and sends it to the printer for the more time-consuming printing operation. Specialized printer options are automated so that they can be used without sending complex command control code sequences each time the option is desired. The user records these sequences in the memory of the device once, and afterward can push a but-

ton on the key pad to access the option. The user can also command the device to convert characters on a one-to-one, many-to-one, or one-to-many basis, and ignore characters that confuse the printer. Other features include several methods to temporarily halt printing, bidirectional RS-232C data transmission, data compression, and graphics compatibility. (List Price: \$495, optional plug-in RS-232C serial card \$125)

Requires: Parallel port.
Applied Creative Technology, Inc.
2723 Ave. E East, #717
Arlington, TX 76011
(800) 433-5373

Model 351 Print Station

An industrial grade matrix printer for data processing and office applications. The printer can be tailored to provide bar code printing, large character printing, and special character sets. Standard features include paper-handling flexibility to accommodate cut sheet, fanfold, and immediate tear-off demand document forms.

Also featured are pin-addressable graphics, 200 cps

Printer Optimizer, Applied Creative Technology, Inc.





Datamate 103 modem, Cermetek Microelectronics, Inc.

data processing printing, 65 lines proportional multi-pass printing, self-test/diagnostics, and bidirectional logic-seeking printing. The printer operates at 110 or 220 volts to allow international usage. Switchable serial/parallel interfaces are standard. (List Price: \$2,195) Jones Electronics Duto Computer Corp., Hudson, NH 03051 (603) 883-0111 Telex: 94-3404 FAX: 710-228-6505

Datamate 103

Auto-dialing Bell 103/113 type modem that communicates at 300 baud, full duplex over standard dial-up telephone lines. The modem allows the host data terminal to extend its processing capabilities to places served by the telephone network, even when unattended. This capability is provided by the on-board serial operation system which offers menu-driven features such as auto-dial and auto-answer.

The modem adapts to the needs of the local telephone switching system by automatically selecting either a DTMF tone or rotary-type pulse dialing method. This provides fast, automatic phone dialing, and enables access to such long distance carriers as MCI and SPRINT.

The auto-dialer permits the terminal to dial directly from its ASC11 keyboard, eliminating the need for an associated telephone, ten dialing commands are supported. The modem can detect progress tones such as busy signals, and recognizes the human voice. (List Price: \$295) Cermetek Microelectronics, Inc.

1308 Borregos Ave.
Sunnyvale, CA 94086
(408) 734-8150

8001 EDLC

A monolithic data link controller chip designed to support the Ethernet specification for local area networks. Operating under the specified protocol, Carrier Sense Multiple Access with Collision Detection (CSMA/CD), the chip helps speed system design implementation, simplify interfacing of microprocessor-based systems with local area networks, and reduce the number of parts needed to put a system onto an Ethernet network.

For design flexibility, all data buffer and management functions have been removed from the chip. This allows the system designer to make the performance and cost decisions appropriate for the design. The chip provides full control of transmit, receive and CPU interface functions within the network. (List Price: \$135 each in 100 piece quantities)

SEEQ Technology, Inc.
1849 Fortune Dr.
San Jose, CA 95131
(408) 262-5041

Model 8950 Electro-Guard

A transformer that isolates terminals from power line noise that could result in memory errors, operating malfunctions, and display noise. The system reduces noise (in the form of electrical pulses) that appear in the power source before it can reach the PC.

The transformer uses separate and shielded coil windings placed in protected boxes and has a continuous power output of 100 watts. (List Price: \$215)

Jones Electronics, Inc.
4050 N. Rockwell Street
Chicago, IL 60618
(312) 463-6500



Supertalker II, Mountain Computer Inc.

Supertalker II

A speech digitizer that translates sound to be entered via a microphone, digitized, and stored on disk for later playback via a loudspeaker or the PC speaker.

Supertalker II includes a plug-in board with 32K RAM, loudspeaker, and microphone.

The digitizer can be used for teaching spelling, math,

New on the Market does not review products, but reports information provided by the manufacturer. If you have a product you would like to have included in this section, send a brief description that includes applications, price, and system requirements to New on the Market, PC, 1 Park Ave., South, New York, NY 10016. Photographs and illustrations are run on a space-available basis.

New On The Market



The Retailer, inventory control program, Lazor Systems, Inc.

and foreign languages. Applications for the handicapped include speech therapy and instructional aid for the blind.

The digitizer can also be used in security systems and in home systems for voice control of appliances and other devices.

Up to two minutes of speech can be recorded on a single disk. Voice output can be accessed with the provided software or with user-developed BASIC programs. Sound reproduction quality is controlled by three separate digitizing rates from 2K to 4K per second. Volume can be controlled by software or by turning the digitizer's volume control knob.

The digitizer's on-board

32K RAM can be used by other programs and applications when it is not used for voice applications. (List Price: \$565, including one year warranty) Requires: 64K, one disk drive, Mountain Computer, Inc. 300 El Pueblo Rd. Scotts Valley, CA 95066 (408) 438-8650

The Retailer

A complete hardware and software system that uses an electronic cash register and the PC to record and keep track of sales and inventory levels for small to medium-sized retail stores. The system controls pricing at the cash register, and records sales transactions as they occur, eliminating re-entering.

Up to 1,500 inventory items can be handled with a

flexible disk system. Use of a Winchester will increase system capacity to 20,000 items and permit simultaneous usage of ordering, receiving and accounting functions while the cash registers are operating.

Included in the package are the cash register and interface, cable, Retailer Control System, Point of Sale Control (including modules for cash registers), bar code wand and counter-top scanner, Inventory Control, Purchasing, Merchandise Receipts, and Mail List Management. All application programs are compiled in BASIC. (List Price: \$4,950) Requires: 192K, two floppy disks, or one floppy disk and one Winchester disk. Lazor Systems, Inc. 1050 East Duane Ave. Sunnyvale, CA 94086 (408) 735-1188

Model 420 Printer

A multicolor printer that performs high-speed draft printing, letter-quality printing, and high-resolution graphics printing. A four-cartridge ribbon system allows printing in four basic colors and certain compound colors can be created with additional passes. Colors may be blended or are available in unbleended form. A number of colors are available including black, red, blue, yellow, green, magenta, cyan, and others.

The printer's speed in the draft mode is 300 cps, in the letter-quality mode it is 125 cps, and in the high resolution graphics mode it is up to 24,000 dots per second depending on dot density. Optimum speed is possible when using only basic ribbon colors since blending requires additional passes. Graphics resolution is 380 by 144 dots per inch. Both letter-quality printing and graphics can be performed without a mode change.

The printer has dual 8088 microprocessors and a 128K buffer which minimizes host involvement and command intervention. (List Price: \$3,950)

Requires: Parallel port, Envision 631 River Oaks Pkwy. San Jose, CA 95134 (408) 948-9755

T-156 Light Pen

Light pen that allows the user to interact with the computer without a keyboard. When the pen is touched to



T-156 Light Pen, FTG Data Systems

screen, the computer responds. Graphics features can be moved, altered, or removed with the pen. This light pen has functions in games, educational programs, and menu selection. Pascal and Fortran driver routines are supplied. List Price: \$159.95, demo/retail disk \$139.95. FTG Data Systems, 8001 Dale, Ste. M-2, Box 625, San Jose, CA 95068. (415) 993-3900

Dataflow Model 700 Label Printers

An integrated family of bar code and general purpose label printers and readers. The system also produces labels, meeting MIL-STD 129H and MIL-STD 1189 (Logmats) requirements. Included are high speed, high density impact printers, medium density matrix printers, and bar code readers. Products may be used separately or in a variety of configurations. (List Price: \$8,900, depending on configuration including documentation, installation and training.) Dataflow Technologies, Inc., 8422 Bellona Ln. #303, Towson, MD 21204. (301) 296-2632

212A-type Modem

A microprocessor based Bell 212A-type full-duplex modem which incorporates auto-dialer and auto-answer capabilities. The modem is compatible with Bell's 103/113, 300 baud standard, as well as with the Bell 212A 1200 baud standard. It operates along as RS-232C interface. The device is available as a stand-alone modem, an OEM board product, or a licensed design. (List Price: \$595) Cermetek Microelectronics, Inc., 1308 Borregos Ave., Sunnyvale, CA 94086. (408) 734-8150

ConvertaBuffer Model CBP-64

A 64K printer buffer that can work with the PC and the IBM/Epson dot matrix printer. The unit accepts data at 1,000 characters per second (cps), stores up to 27 average

pages of data in its built-in memory buffer, then sends it to the printer at a slower speed of 80 cps. The user is then free to use the PC to work on other tasks instead of waiting for the printer to finish printing.

The buffer allows users to format pages before printing in order to skip over perforations, number pages, insert a standard header at the top of a page, and print multiple copies.

The unit comes with its own power supply. Because it connects to the standard parallel printer adapter, it does not require a card slot inside the PC. (List Price: \$299 including integral cables and power supply) Requires: Parallel printer adapter. von Leivendyke Enterprises, Silvermine Ave., Norwalk, CT 06850. (203) 846-4973

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Available from ComputerLand, other dealers, and directly from me for \$80:
Peter Norton 2210 Wilshire Blvd. #1860, Santa Monica, CA 90403

Screen control:

- ScrAtr* - sets DOS to work in any colors
- Reverse* - work in black on white
- Clear* - clears the screen for clarity

Diskette file sorting:

- FileSort* - keeps files by date or name
- DiskSort* - speeds diskette access

Sound:

- Beep* - sounds a tone to alert you

File printing:

- Print* - prints files



"Norton's many utilities have received almost universal praise, and have become an industry standard. No home should be without them." —New York PC Club

New On The Market

PDI464

A combination board that provides six separate functions: expansion memory, two asynchronous serial channels, a real-time clock, a disk emulator, and a print spooler.

The memory section provides up to 256K of fully socketed expansion memory with parity generation and checking. Four memory sizes are available from 64K to 256K.

Two asynchronous serial channels are provided which are compatible with the PC's serial channels. Each channel can be selected to reside at one of four addresses to allow for further expansion.

A selection of data terminal or data communication equipment (DTE/DCE) configurations is provided, eliminating the need for special cables or null modems. Each channel is provided with a 6-foot RS-232 cable.

The real-time clock features quartz-crystal control and a lithium battery backup. The RTC features hours, minutes, seconds, day of the week, date, month, and year with automatic leap year adjustment. Software is provided to initialize system time.

The p-Disk is a disk emulation package provided with the board that allows memory to be treated as a fast disk drive. The p-Disk can be configured as a single- or double-sided drive and can appear as drive B, C, or D. The p-Disk does not require modification or patching of the BIOS and DOS files on system disks.

A background printer spooler is included with the board, which allows for files

to be printed while users are employing other software on screen. (List Price: 256K \$1,095, 192K \$995, 128K \$875, 64K \$795) Pure Data Ltd. 950 Denison St., Unit 17 Markham, Ontario L3R 3K5 Canada

PrintMate 150

A matrix printer that comes in two versions, each available in four different sizes of buffer memory. The A1 model has a front panel keypad to control forms length, print density, and baud rate. The keypad also controls horizontal and vertical tabs, and character set. The A1 model comes standard with a 4K buffer. The B1 model comes without the keypad and has a 2K buffer. Both models of the printer have versions numbered 2, 3, and 4 which come re-

spectively with an additional 16K, 32K, and 64K of buffer memory. Memory is retained when the printer is turned off or unplugged.

The printer forms characters bi-directionally in a logic-seeking mode to optimize system throughput. Printspeed is 150 cps. Users have a choice of a full 136-character line at 19 cpi, or up to 228 columns may be printed by using 12 cpi or 17 cpi density. The printer allows full 136-column printouts to be condensed to fit on standard 8½-inch wide paper. Double-wide characters can be selected in any of the character densities to give a total of six different print densities. (List Price: A1 \$1,125, A2 \$1,225, A3 \$1,275, A4 \$1,345, B1 \$995, B2 \$1,095, B3 \$1,145, B4 \$1,215) Requires: Parallel interface. Micro Peripherals, Inc. 4426 S. Century Dr. Salt Lake City, UT 84107 1-800-621-8848

V.29 Plus Multiport Modem

A synchronous modem that contains a time division multiplexer to accept input from up to four channels, synchronous or asynchronous. Aggregate speeds are up to 9,600 bps. The modem features front panel programming and downline loading of all parameters. Field support is not needed for reconfiguration of the modem at remote locations. (List Price: \$4,800 desk-top model; \$4,100 rack mounted model) Timeplex, Inc. 1 Communications Plaza Rochelle Park, NJ 07882 (201) 368-1113

PrintMate 150, Micro Peripherals, Inc.



VA-12

video adapter that interfaces the PC's monochrome printer adapter to the CB1201M character display.

The adapter plugs into the phone jacks of the NEC display, which requires a slight modification to provide power for the unit. The VA-12 features an adjustable brightness level to vary the normal intensified displays.

The adapter comes with a lifetime parts and workmanship warranty. (List Price:

\$199)
Play Associates
P.O. Box 239
60 Miramor Rd.
San Diego, CA 92126

1050/IBM PC

A magnetic tape subsystem that allows users to read and write data in 9 track format using NRZI or Phase Encoded recording standards. The purpose of the subsystem is to provide data interchange with large mainframe computers. Requires the physical transportation of tape reels. The subsystem consists of a 1/2-inch 9-track magnetic tape drive (with formatter and intelligent controller embedded on the drive), a cable, and coupler card which uses the IEEE-48 bus. Software listings and a magnetic tape program are also included. Each 2400 foot reel of magnetic tape has approximately 40MB of storage capacity. The tape drive sys-

tem has built-in self-test diagnostics verified by LEDs. (List Price: \$8,500)
Requires: 48K.
Innovative Data Technology
4080 Moreno Blvd.
San Diego, CA 92117
(714) 270-3990
TWX: 910-335-1610

Dialmate 820

A modem auto-dialer that retrofits modems that do not have auto-dialing capability. It replaces the RS-232C cables that normally exist between the modem and the data terminal. An accompanying telephone is not necessary unless voice communication is also desired.

212A-type, full duplex modem, Cermetek Microelectronics, Inc.



TAX\$IMPLE—1982TM

- 1. IT IS INTELLIGENT:** It analyzes the client's tax picture, suggests the forms you should fill out. An invaluable tool for analyzing and projecting.
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The cost of TAX\$IMPLE—1982 is only \$200

Call or Write For Information: (64K, Basica, Two Disk Drive)

AJV COMPUTERIZED DATA MANAGEMENT, INC.
44 Center Grove Rd., Q-7, Randolph, NJ 07869 • (201) 782-2517

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CIRCLE 192 ON READER SERVICE CARD

New On The Market

The unit automatically selects either a DTMF tone or a rotary-type pulse dialing method to allow fast dialing speed and access to MCI and SPRINT. It supports ten dialing commands, and has a seven number non-volatile memory that holds frequently called numbers. (List Price: \$249)
Cernetek Microelectronics, Inc.
1306 Borregas Ave.
Sunnyvale, CA 94086
(408) 734-8150

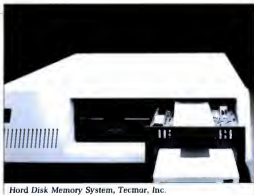
Hard Disk Memory System

A hard disk memory system that has a 5-megabyte capacity and the seek time of a 5 1/4-inch Winchester disk drive.

Because the unit is removable and interchangeable, the memory system offers the unlimited memory-swapping capabilities of a floppy disk system.

The unit is one-half the height of the standard drive and installs directly into the PC chassis or an expansion chassis. The subsystem allows up to four users to share the same mass memory.

The system includes the drive, one cartridge, interface cards, software, cabling, mounting, hardware, instructions, and documentation. (List Price: \$1,795)
Tecomar, Inc.
23600 Mercantile Rd.
Cleveland, OH 44122
(216) 484-7410



Hord Disk Memory System, Tecmar, Inc.

Memory Boards

These memory expansion boards can be installed in any expansion slot. The boards come in 64K to 256K increments and can be optionally configured with a parallel and serial port. Access time is 225 nanoseconds and parity generation and checking are included. All boards come with a 3-year warranty covering parts and labor. (List Price: \$64K)
\$345, 128K \$595, 192K \$795, 256K \$895, parallel port option \$60, RS 232-C serial port option \$60
Frontier Technologies Corp.
P.O. Box 11236
Milwaukee, WI 53211
(414) 964-8698

Sup'r Mod

A modulator which allows a PC with NTSC video composite output to use a color or black and white television set as a display monitor. The product meets new FCC video modulator regulations.

The modulator features a small transformer which plugs

into a standard AC power receptacle which eliminates power supply drainage and the need for computer modification. A video cable with RCA connectors plus adaptors is for use with a 75-ohm cable or 300-ohm twinlead. Optional DB-style adaptors are available. A power regulator is included. One-year warranty. (List Price: \$70)
M&R Enterprises
910 George St.
Santa Clara, CA 95050
(408) 980-0160
Telex: 172923

SOFTWARE

Text Master

A document formatter that has a full set of text formatting functions. These functions include page layout control, text control, and text input from the keyboard or from standard PC-DOS files. Another feature is the program's ability to generate a table of contents and an index automatically. Chaining and nesting of input files allows inclusion of boilerplate text and production of large documents. This program can be used with a printer to print customized form letters, reports, documentation, and formatted listings. It can issue printer-dependent printer control commands, and supports multiple type fonts for a number of printers. (List Price: \$99.95)

Requires: 64K, one disk drive
N.F. Systems, Ltd.
P.O. Box 78363
Atlanta, GA 30358
(404) 252-3302
Source: TCK 071

SUP'R MOD, an FCC approved video modulator, M&R Enterprises





Drawing.
Spacker Software Corporation

Delta Capture/PC

Telecommunications program that communicates with miniframes, microcomputers, 31 bulletin boards. Supports baud rates from 110 to 2400. The program captures data on a remote system into a disk file or buffer. The buffer provides the user with immediate review of the downloaded material. Data can be entered while it is being captured. All or part of the buffered information is transferred to a remote system. Text may be prepared while offline or later transmission. Function keys can be assigned to one numbers, passwords, or frequently used command sequences. The machine code interface is accessible to a user who wishes to make modifications. (List Price: \$20)

Requires: 64K, one disk drive, 232C modem.
Southeastern Software
43 Briarwood Dr.
New Orleans, LA 70128
(504) 246-8438

Delta Drawing

Graphics software that serves as an introduction to programming for children. Color drawings on the monitor use single keystroke commands to control the cursor. Complex pictures, patterns, and designs can be built from simple drawings. Drawings can be saved on a disk and printed if a graphics printer is available. (List Price: \$59.95)

Requires: 64K, one disk drive.
Spinmaker Software Corp.
215 First St.
Cambridge, MA 02142
(617) 868-4700

Screen Formatter

A screen formatting program that allows the user to bypass the question-answer, machine-user, conversational format. Information requests are specified in data statements instead of responding to a series of preconceived questions. The program saves time for the programmer who may have to check answers for numeric values, capital letters, and length. The user can stop questions and request specific information. Data statements indicate the type of data desired, and where the space for the request will be printed on the screen. A series of dashes will indicate where the user should fill in the form by typing over the dashes. The user can backspace, tab to different fields, skip fields, or erase and start over. The program is unprotected and written in BASIC. (List Price: \$35)

Requires: 3K, one disk drive.
PC-Logic Systems
990 Washington St., Dept. 327
Dedham, MA 02026
(617) 329-7900

Mail-Track-I

A program written in compiler form that stores up to 1,100 labels on a single-sided floppy disk and 2,200 on a double-sided disk. The list remains in zip code order. When information is entered, the program warns of duplicate entries. This mailing list handles foreign addresses, stores several files on the same disk, and prints one to four labels across. Selected entries can be moved to a different file and edited. (List Price: \$29)

Requires: 64K, one disk drive.
Sapana Micro Software
1305 South House
Pittsburg, KS 66762
(318) 231-5023

TES 763

A multi-tasking terminal emulator that can replace the Texas Instruments 763 Bubble Memory Terminal. This program runs under Digital Research's Concurrent CP/M-86 operating system and allows all the features of the IBM PC to be used while concurrently exchanging information with the network host computer. It can overcome limitations of the TI 763 by expanding beyond 16 files, using languages other than TIBOL, and speeding up data processing functions (such as authentication). The cost of memory expansion beyond 80K is reduced since this is accomplished by expanding PC memory. (List Price: \$495)

Requires: 256K, one disk, Digital Research's Concurrent CP/M-86, RS-232C interface, modem.

CASyFA

Provides access to host mainframe data files, SNA networks and hard disk storage capacity through the company's SyFA Network Processor. PCs tied into a SyFA network may participate as functional SyFA workstations. The processors are designed for DDP applications ranging from a data entry system to a multi-terminal, multi-network cluster controller. Additional function key emulation is provided allowing the PC to function as an IBM 3270 interactive workstation when operated in conjunction with IBM 3270 emulation software. Additionally, users can operate SyBOL distribution and manufacturing programs.

CASyFA can be implemented through floppy disks. Users may obtain software by dialing in to access the SyFA, clear security, and download to the microcomputer. This allows access to data and storage of up to eight 300 megabyte drives. (List Price: \$2,500)
Computer Automation, Inc.
2181 Dupont Dr.
Irvine, CA 92713
(714) 833-8830

New On The Market

Personal Data Base

A data base program for business and personal use. Personal uses include investment portfolio tracking, wedding and Christmas card lists, family histories, and household budgets and expenses. Business uses include customer and mailing lists, inventory maintenance, tax records, client accounts and job reports. Files and records can be made with complete control over the size and layout of all fields in the individual records. The data base can sort two fields simultaneously, and search three fields simultaneously. The program also averages and totals numeric columns. (List Price: \$125)

Requires: 48K, one disk drive. Super Soft Associates
P.O. Box 1828
Champaign, IL 61820
(217) 359-2112

Personal Investment Analysis

A financial program that lets users answer the "what if" questions that arise in personal finance and investing. Package includes programs for convertible bonds, mortgage loans, investment interest, retirement funding, and tax-free securities. (List Price: \$60)
Requires: 48K, one disk drive. John Wiley & Sons, Inc.
805 Third Ave.
New York, NY 10158
(212) 850-6000
Telex: 12-7063

C-ISAM

A subroutine library written in C that uses the Indexed Sequential Access Method. The library allows programmers to create and manipulate indexed files. Data is read by value, which improves speed. Users can read records with either a full or partial key, allowing or disallowing duplicates on each key. File or record level locking is optional. Composite keys may contain up to eight fields. Ascending or descending order and date type are selectable on each field. (List Price: \$450)

Requires: 24K, one disk drive. Relational Database Systems, Inc.
1208 Apollo Way, #503
Sunnyvale, CA 94088
(408) 746-0982

PC/InterCom

A DEC VT100 emulator that allows users to interactively communicate with various host computers. The program has video terminal, and full screen functions, allows upload and download data transfers, and permits the use of host word processing and spreadsheet programs. Includes a program and VT100 manual. (List Price: \$99)

Requires: 64K, one disk drive, RS-232C interface, modem. Mork of the Unicorn, Inc.
P.O. Box 423
Arlington, MA 02174
(617) 489-1387

FORTH-32

A language intended for software development that allows the programmer to use the entire IBM PC memory without considering segment boundaries. This is accomplished by providing a 32-bit address mode, as well as a 16-bit address mode. Addresses in the first 84K relative to the load address can be specified by a single word (16 bits). The 32-bit address is used only when a program exceeds 64K. This means that programs developed with FORTH-32 that do not exceed 84K use the same amount of memory as programs developed with a FORTH-based system. The program interpreter has a mode sensing switch to avoid doubling the memory requirement by recording 16-bit addresses as 32-bit addresses with the high word zero. This switch determines whether 16 bits are sufficient to specify an address, or if 32 bits are necessary. If a program requires more than 64K, the compiler intermixes 32-bit addresses with 16-bit addresses. At run time, the interpreter unveils the compiled mode into the dictionary and handles the addresses appropriately. Also included are a package builder utility, assembler, decompiler, screen editor, debug, DOS interface, case statement, and user manual. Graphics are provided with dot, line, circle, point and color capabilities. (List Price: \$150)

Requires: 64K, one disk drive. Quest Research, Inc.
P.O. Box 2553
Huntsville, AL 35804
(800) 558-8088
(205) 533-8405

SBAPREP

A menu-driven program that develops and prepares Small Business Administration loan applications.

Documents prepared include the Use of Loan Proceeds, cover letter, P & L Projections, SBA Balance Sheets, Debt Schedule, Prepares and Ages receivables and payables, collateral loan schedule, SBA personal history forms, and personal financial statements. It also prepares cash flow charts, index and separator sheets for total loan packages, and SBA form 601s. (List Price: \$500)

Requires: 64K, one disk drive. Single Source Solution
P.O. Box 578
Concord, CA 94522
(415) 680-0202

Nutritionist

An interactive graphics diet analysis program. It automatically displays nutritive analyses of foods, meals, and complete diets in terms of weight and percent of Recommended Daily Allowance. Included is an expandable data base (composed of the 18 nutritive components of more than 700 foods), a user manual, and USDA source reference. (List Price: \$145)

Requires: 64K, one disk drive. N-Squared Computing
5318 Forest Ridge Rd.
Silverton, OR 97381
(503) 873-5906

1-2-3

A program that combines the functions of spreadsheet, graphics, and information management on one double-sided, double-density disk. The combination of multiple features and their ability to interact with one another is called "synergy." Information is automatically available for spreadsheet and graphic interpretation, statistical analysis, or report generation. The information manager stores and retrieves over 2,000 records. Information is sorted using primary and secondary keys and is retrieved using up to 12 criteria. The spreadsheet measures 2048 rows by 256 columns, with a 500K model capacity. It features advanced cell and page formatting, named cells and ranges, currency and percentage notation, and variable column width. Pie, line, bar, stacked bar, and x-y charts are produced with the program's graphics functions. Each graph has legend, titling and scaling features. Planning possibilities and variations are considered with single keystrokes that provide new graphs. Text processing features allow production of memos, notes, outlines, tables, and brief reports. Tutorial aids are provided to make the program accessible to first-time users. (List Price: \$495) Requires: 128K, one disk drive.

Lotus Development Corp.
35 Wheeler St.
Cambridge, MA 02138
(617) 492-7171



1-2-3 on applications combination package, Lotus Development Corporation

Data Design

A menu-driven business program that includes interactive help screens for overview and quick reference. Supports multiple user-defined data tables and input/output forms. All information is entered, viewed, changed and printed using these forms. For flexibility, each form can have up to 40 fields and 26 forms per table.

Features user-definable record size, field type and width, and print-formatting for custom reports. Information can be retrieved in ascending or descending order.

Full support for hard disk drives and an optional Query Language are available.

Ready-to-use forms, such as mail list management and an accounts receivable system, are also offered. (List Price: \$225)

Requires: 128K, one disk drive or hard disk, (optional printer).
insoft, Inc.
10175 SW Borbur Blvd.,
#202B
Portland, OR 97219
(503) 244-4181

Blue Lynx

A hardware and software system that permits immediate integration of the PC into existing mainframe computer networks. When equipped with the Blue Lynx plug-in communications card, the PC emulates the IBM 3270 series of controllers, display devices, or printers operating under SDLC protocol.

Local work, such as word processing, spreadsheet calculation and local database activities, can be performed while disconnected from the network. This can reduce line cost and mainframe time.

A bisynch protocol is also offered as well as IBM 3278 emulation for situations that require connection to existing cluster controllers via coaxial cable. Up to eight printers can be attached to the primary PC. (List Price: \$890)
Techlord Systems, Inc.
39 Carwell Ave.
Mount Vernon, NY 10552
(914) 699-8487

Euramicro

A financial reporting system that aids in the process of credit analysis. The program performs credit spreads, financial analysis, comparison reports and forecasts. Three standard report printouts are offered: Financial Summary, Balance Sheet and Income Statement, and Cash Flow. If a more customized model is needed, line titles, ratios and print formats may be altered. Models are designed to fit 10 industry formats, including manufacturing, finance, utilities and banking.

New On The Market

Programmers can input data directly, or retrieve data from six financial data files housed on a time-sharing network. The PC can be converted to a time-sharing terminal for this purpose, offering access to Eurabank—a file on 2,100 non-U.S. banks, Computast—Standard & Poor's file on 7,500 U.S. companies, Extstat—a file on 2,300 Western European Industrials, FDIC—a file on 14,800 U.S. banks, FSLIC—a file on 5,500 Savings and Loans Associates, and NIKKEI—which contains information on 12,000 Japanese industrials. The reports may be generated off-line. (List Price: First year \$4,000, includes report generating program, utility program and manufacturing format; additional industry formats \$200; forecasting program \$1,000; annual licensing fee \$1,000)

Requires: 64K, 80 cps IBM Dot Matrix Printer, PC-DOS, European American Bank 10 Honover Sq. New York, NY 10015 (212) 437-4532
Telex: ITT 420771

Architectural Engineering Master Accounting System

A financial package designed specifically for architecture, civil engineering, and other professional firms where monitoring special projects is required. Five modules are available: Job Costing, Payroll, Accounts Receivable, Accounts Payable, and General Ledger. Each module can run on a stand-alone basis or can interact with others.

Job Costing allows managers to monitor summarized or detailed project costs. Costs may be displayed in dollars spent or in employee man-hours. With the Payroll program, a single entry in the time card helps compute employee pay and job costing information. It calculates employee wages and deductions, prints paychecks, and maintains tax information. Accounts Receivable and Accounts Payable automate the billing process and permit cash flow forecasting. General Ledger features consolidated financial reporting capabilities for multiple divisions and departments. It allows actual year-to-date figures to be compared against budgeted figures and previous year-to-date figures, and accommodates up to 13 accounting periods.

Financial data is held for as long as needed, allowing users to access costs incurred in the past. (List Price: Job Costing or Payroll \$998; Accounts Receivable, Accounts Payable or General Ledger \$798)

Requires: 128K, 5 MB Winchester disk drive. Data-Basics, Inc. 11000 Cedar Rd. #110 Cleveland, OH 44106 (216) 721-3400

PrtSc

A program that reproduces screen images on Epson or IBM Dot Matrix printers. When loaded into the memory, it becomes an extension of the IBM Disk Operating System (DOS). By pressing the shift and PrtSc keys, text on a monochrome display, or text and high-resolution graphics on a color display or television set are automatically printed. PrtSc recreates all 256 text characters, math symbols, line art, shaded and solid areas, reverse video, underlined text, and non-display fields.

Users can quickly store screen images on a disk, for future review or automatic printing. This feature may also be used to create a computer "slide" presentation or unattended demo. (List Price: \$58)

Requires: 48K, PC-DOS, Graftek-equipped IBM Dot Matrix Printer, Epson MX-80, MX-80FT, or MX-100. Rodio Technology 8 North Main St., #111 West Hartford, CT 06107 (203) 232-9974

KSAM

Keyed sequential access method that enhances the capabilities of UCSD p-System microcomputer operating system. Designed for such applications as inventory control and accounts receivable where fast access to information is necessary. KSAM supports sequen-

tial and keyed retrieval of data. Designated records are contained in files and are retrieved by identifying "keys." Examples of keys are part numbers for inventory control, and customer names for mailing list applications.

A "look-aside" buffering technique helps eliminate unnecessary disk access, minimize arm movement, and increase retrieval speed. (List Price: \$200)

Requires: 64K, two floppy disks, UCSD p-System. SofTech Microsystems, Inc. 16885 West Bernardo Dr. San Diego, CA 92127 (714) 451-1230
TWX: 910-335-1594

Print Spooler

A program that sends one or more text files to a printer while the user continues normal p-System operations, such as text editing or data entry. The user can create a print queue of up to 21 files, delete files from the print queue, and display the name of files currently in the print queue. Printing of current files can be temporarily or permanently halted, and re-continued. (List Price: \$50)

Requires: 64K, two floppy disks, p-System. SofTech Microsystems, Inc. 16885 West Bernardo Dr. San Diego, CA 92127 (714) 451-1230
TWX: 910-335-1594

quirm
game whose object is to collect as many diamonds as possible, while evading hordes of ghosts protecting the horde. The more diamonds collected, the harder it is to "squirrel" around the diamond horde without being caught by the ghosts. Each diamond is worth \$1,000. High score and the initials of the player making the high score are reported at the bottom right of the screen. The game can be played from the keyboard or with joysticks. (List Price: \$35)
Requires: 64K, one disk drive.
InfoSoft
226 North Madison Ave.
Austin, TX 75208
(414) 389-0795

Keynote Keyboard Enhancer

An updated keyboard enhancer that permits single keystrokes to represent typed phrases, paragraphs, letters or program commands. These strings make it possible to redefine many of the PC's keys, and allow the most frequently used key assignments to be kept in files for future purposes. (List Price: \$99.95)
Requires: 16K, one disk drive.
Advanced Software Interface
2655 Campus Dr.
San Mateo, CA 94403
(415) 572-1347

Graphwriter/IBM PC

Two graphics programs that together provide 40 different formats. Unusual formats include Gantt charts, organizational charts, horizontal bar charts and table generation. Charts can be placed anywhere on a page. There are no fixed-lock positions for graphics elements allowing most features on the page to be edited. The program is menu-driven and automatically composes the chart once specifications are selected. Each program offering different formats is available separately. (List Price: \$750, Graphwriter \$395, Enhancement I \$395)
Requires: 128K, two disk drives.
Graphic Communications, Inc.
200 Fifth Ave.
Waltham, MA 02254
(617) 890-8778

Datewriter

A client write-up system designed for accountants. The program consists of three parts: Client Files, Journalizing/Data Entry, and the Datewriter-Report Writer System. Any number of clients, with whatever account numbering structures desired, can be processed. Variable account formats may also be set up. Each client's complete past and current budget information can be stored. The Journalizing program has a built-in system security, and operator prompts. It allows flexible data entry, unlimited journals, automatic allocations, and recurring entries. In addition, a payroll system is also available. The Datewriter feature allows the accounting firm to

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#145 14 1/2" h x 18 1/2" w x 11 1/2" d



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New On The Market

define different formats, descriptions, and detail, depending on client needs. Users may design their own report formats, or may choose from given examples. (List Price: \$34.95)

Requires: 128K, hard disk. Accountants Microsystems, Inc. 1404 140th Pl. N.E. Bellevue, WA 98007 (206) 643-2050

Execuware Know Your Client

A program that maintains client information. The program gives the client's name, company, title, and phone number. It also reports the date and subject of the user's last contact with the client. Personnel data such as the client's birthday, bobbies, and name of spouse are also given. A retrieval system is used to eliminate search time so information is presented immediately.

The program notifies the user of clients which haven't been contacted in the last 30 or 60 days. The user is also reminded of follow-ups. Notes can be made while talking to the client during the information report. Clients can be cross-indexed into different categories. No programming or codes are necessary. Reports can be generated on a printer. (List Price: \$124.95) **Requires:** 64K, one disk drive. Aeronco, Inc. Microcomputer Software Division 4530 Pork Rd. #348 Charlotte, NC 28209 (704) 525-8881

EZ*Retail 2.0

A program that turns the IBM PC into a cash register for businesses that do not have a large number of daily sales. An item look-up feature displays descriptions of up to 10 characters, costs, normal list prices, inventory and sales prices on a screen formatted like an invoice. Inventory update is automatic and the user can set notifications for point of re-order. The screen display can be optionally suppressed when a discrete transaction is desired by a customer or salesperson. Employee commissions can be calculated using either a margin or list price. Reports provide analyses of sales, credit card charges, commissions and taxes. Customers can be updated to the customer file during a sale. An optional mailing label system is available which can interface with the customer list (but this feature requires double-sided drives). (List Price: \$245, optional mailing label system \$75) **Requires:** 48K, two disk drives.

Doto Consulting Group 877 Bounty Dr., #203 Foster City, CA 94404 (415) 349-4001

T.I.M. III

An enhanced version of the Totol Information Management (T.I.M.) data base management system is available in a compiled version. Speed improvements allow the program to sort, search, and print data more quickly.

The T.I.M. III program organizes, stores, and retrieves information in various formats.

New features include global search and replace functions. T.I.M. III can also add figures among fields, move a constant into any field, move one field to another, and delete multiple records chosen under the select criteria.

It can also perform these functions on one or more fields with a single command.

Data can be converted from T.I.M. III files into files which can be read by a word processor, VisiCalc, or the manufacturer's graphics package. (List Price: \$495. Upgrades for registered T.I.M. III disks are available for \$10; users should send a check, their original T.I.M. III disk, and a written request to the manufacturer) **Requires:** 64K, DOS, two disk drives.

Innovative Software 9300 W. 110th St. Overland Park, KS 66210 (913) 383-1089

Cost Estimating

A program that performs cost estimating for contractors, engineers, and architects. The program stores data input for unit costs of labor and materials. The user enters the quantity for each item, and the program calculates and formats the title, material, quantity, and units. Unit costs, labor costs, and total costs are also calculated. The same unit cost data can be used for different jobs without reentering data. Data can be printed in a cost sheet format. The program is unprotected and includes the source code in BASIC. (List Price: \$300) **Requires:** 48K, one disk drive.

Richard Coldwell Construction 60 Broome Dr. Santa Cruz, CA 95080 (408) 423-9400

PC File

An unstructured data base program that stores information in a free-field format.

Each record of information is divided into two sections, the Keyword section and the Text section.

The Keyword section acts as a file folder label. The Text section can hold contents such as the abstract of a paper, a description of a piece of property, or a quote.

The program can be used as a bibliographic management system, a reference file for a speaker or writer, or an item manager. (List Price: \$49) **Requires:** 64K, one disk drive, 80-column monitor. TexoSoft 3415 Westminister #100 Dept. A Dallas, TX 75225 (214) 369-0795

Accounts Payable System

A program that maintains accountability of payables for companies. The system includes vendor support, voucher processing, and period end processing. It also handles recurring payables, such as fixed form and perpetual payments like rents. Users receive a complete listing for all post entry transactions that involve a voucher, including partial payments, memos, credit and debit memos. (List Price: \$395)

Requires: 64K, one disk drive. Solid Software.
5500 Interstate North Pkwy.
#501
Atlanta, GA 30328
(800) 554-4078
(404) 952-7709.

VisiWord, VisiSpell

Two word processing programs that integrate with the manufacturer's other VisiSeries business programs. These two programs include features that allow users to incorporate VisiColc models into their finished documents.

The VisiWord program includes standard word processing features such as word wrap, autocorrection, and justification. It justifies and formats text so printed text always corresponds to what is viewed on the screen.

The program also provides document formatting features that allow users to change vertical and horizontal spacing, margin settings, and justification throughout the document.

The VisiSpell spelling checker program allows in-place word correction as it scans through a document in

one pass. It includes a dictionary of over 100,000 words and a word "guessing" feature that can be adapted to the most common errors for a particular writer. The user can supplement the dictionary with additional, frequently used words. (List Price: VisiWord \$375, VisiSpell \$225)

Requires: 128K, two disk drives.

VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408) 946-9000

Superfile

A data base program specifically designed for text organization. Key words are used to cross reference and retrieve information. Up to 250 key

words can be identified for each entry. The program automatically creates a key word dictionary so that data can be accessed from up to 255 disks. The user can search up to 100 entries per second. Searches can be linked with the words "and", "or", and "not". The format does not limit length or style of entry. (List Price: \$195)

Requires: 64K, two disk drives.
FYI, Inc.
P.O. Box 10996 #615
Austin, TX 76766
(800) 531-5033
(512) 348-0133.

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AUTOSORT

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Output file can be full records, rec pointer & sort keys, or rec pointer only

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Next, Previous
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of Open Deletes
of Data Records
of Primary Keys
Max Key Length

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298 21st Terrace S.E., Suite 100, Largo, FL 33541 (813) 586-1886

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Data Base Management System

A DBMS system that creates data files that can be updated or modified at any time.

The program generates reports using operator-specified parameters and fields. Fields can be compressed or sorted. (List Price: \$150 including manual; manual only, \$20)

Requires: 64K, one disk drive (printer recommended).
Universal Data Research, Inc.
2457 Wehrle Dr.
Dept. B
Buffalo, NY 14221
(716) 631-3011

Apple-IBM Connection

A software package that allows information transfer between the IBM PC and the Apple II computer. The package comes with one unprotected disk for the Apple II, and one disk for the IBM PC which allows the user to make a single backup copy.

The connection is made through a modem or a direct cable. The program has been designed specifically for these two computers and includes menu-driven file manipulation features. The program duplicates files created on one machine and transfers them into files which may be used on the other machine. Either machine may operate in a "master" or "slave" mode so that the user may control communications from either end. VisiCalc files and Word-Stor files are transferable as well as programs written in BASIC, Pascal, and FORTRAN. Automatic error-checking prevents file changes between computers. Screen

menus and English commands assist file manipulation. The user is notified when the file already exists, or when the disk is full. In addition to file transfer, electronic mail messages may be sent between the different computers. The package includes a manual which also describes procedures for use with an Apple III computer. Also included is a cassette tape to verbally introduce users to the program. (List Price: \$195)

Requires: Two computers (each with 64K), one disk drive, communications card, modem.
Alpha Software Corporation
8 New England Executive Pk.
Burlington, MA 01803
(617) 229-2924

Zipcom

An asynchronous communications program that supports any printer attached to the PC's parallel printer port.

The program creates a dynamic hugger in RAM where line speed is synchronized with the printer.

The program supports modems using Bell standards 103, 202, 212, other asynchronous modems, and local direct machine hookups at speeds from 5 characters per second (cps) to 960 cps. The program can also record print-image and record format files on disk. Standard built-in translation tables along with user programmable translation

tables allow the program to upload or download files from memory or disk to any other computer.

Two screen management routines are included: line by line mode (TTY emulation) and screen editor mode. (List Price: \$75)

Requires: 32K, one disk drive, asynchronous communications adapter (Parallel printer port and printer recommended).
Zipco Inc.
400 Quivros St.
Denver, CO 80204
(303) 534-2097

\$PLOT, \$PLOT

A program that generates medium-resolution hard copy graphics on the IBM or Epson MX-80 printers with TRS-80 graphics.

The program reads data files generated by the user's programs. Sample utility programs are included with \$PLOT. The X-Y data is then converted into strings of TRS-80 graphics characters which can be printed out. Effective resolution is 203 by 93. The program was written in BASIC with a sort subroutine in machine language.

\$PLOT is a plotting program for PCs that have printers with Graftrax-Plus. Effective resolution is 350 by 160. (List Price: \$14.95 for both programs)

Requires: 64K, one disk drive, 80-column display.
Redox Software
P.O. Box 8
Yorktown Heights, NY 10598

R/BUF

A software printer buffer that allows users to start work on new texts without waiting for printing to finish.

The huffer is compatible with PC-DOS. Users can enter a single command to start automatic buffering into RAM or output destined for the parallel printer.

R/BUF does not require any additional hardware or modification of the system's present configuration. It can utilize additional RAM installed on one or more memory expansion boards.

R/BUF appends itself to DOS and intercepts the printer and clock interrupts so as to be invisible to programs that utilize the printer. Word processing, financial modeling, and other programs that output to the printer can use R/BUF without modification.

The buffer also accepts at RAM speed the output destined for the printer. As soon as the data stream is buffered in RAM, R/BUF returns control to the program that initiated the printer operation. (List Price: \$50)

Requires: 32K RAM, one disk drive.
Cosmos Inc.
3448 State Highway 505
Onolosso, WA 98570
(206) 228-9362

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Integrated software for the IBM-PC • \$595⁰⁰

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COMP-ART

A software product that allows users to draw pictures with specified function keys. Capabilities include circle, line, paint, text, and erase functions. The program automatically generates the required code, and saves the results in specified file. (List Price: \$39.95)

Requires: 64K, two disk drives, 40 column display, color/graphics adapter, Advanced BASIC.
Norfolk Systems
8 North Fork Rd.
Laurel Springs, NJ 08021
(609) 763-3307

ProKey

A program that allows users to customize their keyboards.

Users can create single keystroke abbreviations for strings of up to 1,000 characters. Strings can contain arguments and two types of "fill-in-the-blank" fields. The program can be used by novices or by more advanced users to create macro structures.

ProKey installs on PC-DOS and can be used in any other program without exiting. Users can use over 90 ProKey strings during a work session and can save strings in editable and printable files for future use. (List Price: \$50)

Requires: 64K, one disk drive.
ProSoft
4744 9th Ave. NE
P.O. Box 5850
Seattle, WA 98105
(206) 832-3603

UAPLINK

An expanded version of the manufacturer's UAPLINK program for file transfer and media conversion.

The program now allows users to link similar and dissimilar operating environments in either a micro-to-micro or micro-to-mainframe configuration.

The UAPLINK features single-user control, protocol-protected binary and text transfers, data compression virtual user facility, and intelligent terminal mode. (List Price: \$250)

Requires: 84K, one disk drive.
Unique Automation Products
17922 Sky Park Circle, Ste. L
Irvine, CA 92714
(714) 549-4832

EDVANCE

A UCSD p-System screen-oriented editor. The program can "paint" tables and graphs on the terminal screen, suspend a current editing session, and "remember" keystroke sequences through user defined macros. It also edits a file from within a file, returning to the original file, and obtains a menu of text files from within the editor. (List Price: \$200)

Requires: 64K, two floppy disks, UCSD p-System.
SoftTech Microsystems, Inc.
16885 West Bernardo Dr.
San Diego, CA 92127
(714) 451-1230
TWX: 910-335-1594

Data Security

If you have confidential information that must be protected, then the Cybersoft Data Security System is the answer. The Cybersoft DSS is an all-software system that encodes your data using a unique encryption key that you specify, so that only you (or others you give the key to) have access to that data. DSS will encode any file in any format, even programs.

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CyberSoft Incorporated



P. O. Box 151, Waterloo, Ontario, Canada N2J 3Z9

New On The Market

BPS Business Graphics

A management program that allows PC users to create multicolor charts and graphics. Graph data can be entered from the keyboard or extracted from VisiCalc and SuperCalc models, accounting reports, and word processing documents. Users can create such graphic formats as lines, horizontal and vertical bars, multiple bars of up to four sets, pies, partial pies, areas, points, and any combination of these on the same axes. Users can also create horizontal and vertical grid lines as well. The commands for generating frequently used graphs can be stored on disk, enabling users to create or update standard graphic reports automatically.

The program performs several statistical functions, including moving average and exponential smoothing, curve fitting, and specification by constant, line, logarithm, parabola, and sine. Calculation of minimum, maximum, sum, mean variance, and standard deviation is also included. (Price List: \$350)

Requires: 128K, two disk drives, color/graphics adapter. Business & Professional Software, Inc.
143 Binney St.
Cambridge, MA 02142
(617) 491-3377

p-Comm

A communications/terminal emulator program that works in combination with the UCSD p-System. The program supports a phone directory that can be used in either an office or home environment.

The number of entries on the program is limited only by available disk space. The program's features allow users to add, delete, change, and move entries. Other features include autodial, redial, semiautomatic log-on, upload, download, X-ON/X-OFF, transmission throttling, and printing.

Fifteen entries can be displayed on the screen at the same time. (List Price: No charge. Users can send either a formatted disk with a stamped, self-addressed return envelope or \$5 to cover postage costs.)

Requires: 64K, two disk drives, UCSD p-System.
R.F. Belanger
7122 Cother Ct.
San Diego, CA 92122
CompuServe: 70235, 1270

Datatest

A screen editor program that allows users to enter, edit, and manipulate text on the screen. Users can create and edit files and can both enter and edit lines of text up to 225 characters wide.

Complete operator prompting is provided. The program makes use of function and cursor control keys.

Program features include automatic wraparound of words when inputting and editing text, insertion of new text into existing files, and movement of blocks of text. Deletion of any amount of text is possible, and deletions may be reversed after the Delete command is executed. Automatic creation of a backup copy of a file is possible. Decimal tabbing for input of financial data is also provided.

Users can perform global search and replace both forwards and backwards in text. A replacement query option allows users to view the revised text before confirming the change.

The designated character string of the global search and replace can be made case-sensitive. (List Price: \$275; demonstration disk and manual \$75; manual only, \$30)

Requires: 96K, two disk drives.
Datatest
2821 Enterprise Rd.
Clearwater, FL 33515
(800) 237-5014, (813) 797-6464

Palantir

A revised, menu-driven program that formats text on the screen and allows users to print with a proportional print element.

Originally available for CPM systems, the program formats text on the screen as it will appear when printed. Boldfaced characters are highlighted, underscored characters are underlined, and messages appear in inverse video.

Palantir uses function and cursor keys. All commands are interpreted on the screen. Users do not need to imbed commands.

A form letter function. Mailout, allows full variables merging with external data files, nesting with external text files, and conditional execution of commands. (List Price: \$450)

Requires: 64K, two disk drives, PC-DOS or CPM-88.
Designer Software
3400 Montrose #718
Houston, TX 77006
(713) 520-8221
Telex: 790-510

New On The Market

Strohl Stock System

A menu- and function key-driven program that makes financial analysis of stocks based on the history of selected stocks. The program also provides buy/sell-short recommendations and buy/sell stop points after each daily update.

The program can be used by novice users and includes a configuration program that sets up the necessary information for automatic log-on to the Dow Jones News/Retrieval system.

Other features include automatic daily updating of stock prices and automatic entry of daily historical prices of a new stock when it is added

to the system. (List Price: \$495; demonstration disk with user's guide \$50, applied to purchase)

Requires: 128K, two disk drives, color or monochrome adapter, monochrome or high-resolution color display, asynchronous communications adapter, Hayes Smartmodem, subscription to Dow Jones News/Retrieval service. Strohl Systems Group, Inc. 661 West Germantown Pike Plymouth Meeting, PA 19482 (215) 825-6220

Full Screen Editor

A full screen editor that can be used with 40- or 80-column, monochrome, or color monitors. Its features include full cursor control, vertical and horizontal scrolling of up to 254 characters per line, and Help screens.

Other features include a disk directory; character insert, delete, and replace; line

insert and delete; and copy, move, and find commands. Line numbers can be generated and displayed or suppressed, and a line number command will display a page of text starting with the line number specified. Special characteristics can be embedded in the text by using the Alt key and number pad keys. The ten function keys are user-definable and can be displayed or suppressed. (List Price: \$75)

Requires: 128K, two disk drives, DOS, color/graphics adapter. Sunshine Computer Software Co. 1101 Post Oak Blvd. #9-493 Houston, TX 77056 (713) 552-0949
SOURCE: ST7013
CompuServe: 72245,1555

Plan80

A financial planning system that performs "what if" analysis. Math functions that analyze worksheet problems are also included.

Users can review assumptions and methods with the program. Plan80 prints to disk or can be used with a word processor to combine written text with its reports.

Plan80 can solve any numeric problem that can be defined in worksheet format. It calculates averages, depreciation, ATAN, internal rate of return, and trig functions. The program can also consolidate files and create a new model from one or several old models. (List Price: \$295; manual only, \$45)

Requires: 128K, two disk drives, CP/M-86 (printer recommended). Digital Marketing 2670 Cherry Ln. Walnut Creek, CA 94596 (415) 938-2880

We have developed an 8" diskette system called "THE FILE CONNECTION" that can be used to exchange source, data, and word processing files between the IBM PC and hundreds of other computer systems. We use a modified IBM diskette controller card to attach either 1 or 2 external 8" drives to the IBM PC. Our utilities work with all IBM models including the 3741, 5120, S/1, S/34, S/38, S/370, 43XX, and Displaywriter. Other systems include DEC, NCR, TRS80, Univac, Burroughs, Honeywell, and CP/M.

Our programs provide automatic format identification and accept diskettes with 1 or 2 sides, single or double density, and 128, 256, 512, or 1024 bytes/sector. Source file reformatting and ASCII-EBCDIC conversion is included. The diskette can also be used as a 1.2 Mbyte or 320 Kbyte DOS drive.

The complete system price including TANODN 848-12, enclosure, cable, and basic utility programs is \$1295 for one drive and \$1995 for two drives. For users who want to use their own drives, the basic utility programs and documentation are available for \$695. Payment is by check or CDD with delivery within 10 days.



"THE FILE CONNECTION" 8" DISKETTE SYSTEM

FLAGSTAFF ENGINEERING • (602) 774-3588
2820 WEST DARLEEN • FLAGSTAFF, AZ 86001

Tax Mini-Miser

A spreadsheet tax planner that allows users to compute and analyze the effects of different tax strategies.

The program was designed for use by accountants, lawyers, financial planners, stockbrokers, bankers, and investment counselors.

Tax Mini-Miser can compute the effects of up to six alternative tax strategies over a 1-year period, or one strategy over an extended period of up to 6 years. It then indicates the best tax computation method for each year or strategy. Computation of regular tax, income averaging tax, alternative minimum tax, and reference tax is provided.

Features include a full screen display of data in spreadsheet format. A "sensitivity analysis" feature determines the tax impact of a single change. (List Price: \$295) Requires: 46K, one disk drive, 80-column monitor, 80-column printer.

Microsoft Inc.
984 El Comino Real #125
Sunnyvale, CA 94022
(408) 882-8000, (415) 965-0000

REIA—Real Estate Investment Analysis System

A program that provides both novice and experienced real estate investors with a comprehensive, five-year analysis of any proposed income property investment.

The program can provide information on residential, commercial, and industrial property, and accounts for all significant factors that will affect the eventual profitability of a real estate investment.

The program can provide both summary and detailed reports that display general information on investment attributes, income, expense and cash flow analysis, tax implications, and return on investment predictions. Reports which include individual loan and depreciation schedule analysis can be produced. Reports are arranged in a presentation format.

The program can be used for modeling alternative purchase options. Loan terms, expense estimates, appreciation assumptions, and other factors can be changed to show the bottomline effect on cash income, tax shelter, capital growth, and net profit. (List Price: \$120; manual only, \$30)

Requires: 64K, one disk drive, 40- or 80-column display, 80-column printer.
Notional Investment Services, Inc.
P.O. Box 586
Citrus Heights, CA 95611

VersaLedger II

A general ledger program that can be used for any type of business. The program is part of the manufacturer's Versa-Business Series of five independent modules that can be coordinated in any combination.

VersaLedger II consists of two sections. One maintains the general ledger. By using an accounts chart, users can make journal entries and print accounting reports. The second part of the program can maintain one or more checking accounts and has the ability to print checks and check registers and to post checks and deposits to the general ledger part of the program.

The program also features a spreadsheet-type report that allows users to change the format of income statements and balance sheets.

Users can define each line of a report including all titles and subtitles. Indentations, items to be summarized, and all totals and subtotals. (List Price: \$149.95)

Requires: 64K, two disk drives, printer.
H&E Computronics Inc.
50 N. Pascock Rd.
Spring Valley, NY 10977
(914) 425-1535

MicroFCS

A decision support system that can run without syntax change on IBM PC's System 34, and mainframes.

Some of the MicroFCS features include: modeling logic for "calc" runs or complex relationships, a data editor for logic modification, command files, and 75 prewritten functions. Financial functions including consolidation, a report generator, and user-written commands or functions are also included.

The program offers "what-if" analysis, data management, full programming functions, interactive input, full screen editing facilities, and full communications with host computers. (List Price: \$2,000)
Requires: 256K.
EPS, Inc.
One Industrial Dr.
Windham, NH 03087
(603) 898-1800

Money Tree Software

A set of financial and tax planning programs which have been converted to the SuperCalc spreadsheet program from Sorcim.

The programs are modular and allow users to perform "what-if" analysis of capital needs, tax shelter investments, investment diversification, retirement projections, and Federal Income Tax impacts upon investments. The user is then able to advise clients using reports and schedules generated and printed by the computer.

The original version of the

New On The Market

program templates were implemented on VisiCorp's VisiCalc. (List Price: \$300 to \$600 per module, demonstration package \$100)

Requires: 128K, one disk drive, SuperCalc.
Money Tree Software
550 SW Fifth St.
Corvallis, OR 97333
(503) 757-1114

File Transfer Program

A program that allows the transfer of files from the Radio Shack Model I and Model III systems to the PC.

Communications programs for both systems are included, as well as an adapter that connects the two computers, and a test communication file for verifying correct connection and proper transmission.

File concatenation is possible and files of any length can be sent. This program supports baud rates of 110, 150, 300, 600, 1200, 2400, 4800, and 9600.

The package can be used to transfer programs, text files, and spreadsheet data. (List Price: \$39.95)

Requires: RS-232 board, one disk drive.

Personal Computer Products
1400 Coleman Ave., Ste. C-18
Santa Clara, CA 95050
(408) 988-0164

Word-Score

An enhanced version of the Hangman word game that allows from one to four users to play.

Users can choose from four levels of difficulty. Two hundred words are supplied in the first four levels of play. A fifth level is available under which specific words can be preloaded.

A score board, display of unused letters, and sound are also provided. (List Price: \$29.95)

Requires: 64K, one disk drive, color/graphics adapter. Advanced BASIC, and 40-column display.

Norfolk Systems
8 North Fork Rd.
Laurel Springs, NJ 08021

Life

A strategy program that generates changing patterns on a grid. Users can create patterns with keystrokes and see their patterns "grow" or "die." Pattern arrangements can be produced that live for many "generations."

Program features include help screens, ten preset screens of examples, and the ability to save screens to disk. (List Price: \$17)

Requires: 32K, one disk drive, color/graphics adapter.
Olive Branch Software
1715 Olive St.
Santo Borboro, CA 93101
(805) 962-4682



Space Saver Printer Stand, B.T. Enterprises

SuperWriter

A word processing program that interfaces with the manufacturer's SuperWore family of business application programs.

The program incorporates capabilities for mailing list/form letter generation and includes a dictionary for checking spelling and typing errors.

Users can create, edit, proofread, and print reports, letters, and other documents without repetitive entry of text.

Users can interface the program with other SuperWore programs without having to learn new commands or codes.

Other features allow users to save edited text files under a different name on the working disk, or under the same name on a different disk without changing the original file. (List Price: \$395)
Sorcim Corporation
2310 Lundy Ave.
San Jose, CA 95131
(408) 942-1727

ACCESSORIES

Space Saver Printer Stand

A printer stand made of clear plexiglass which stores continuous form paper under the printer. The stand is available for 80-column and 132-column printers. Both sizes are available with an optional shelf for storage of a second type of continuous data form. The large stand comes with an optional slot, allowing paper to feed up through the stand to accommodate bottom feed printers. (List Price: \$29.95)

B.T. Enterprises
108 Carrough Rd.
Bohemia, NY 11716
(516) 567-8155

Printer Cables

A line of cables that connect the IBM PC with a large variety of printers. The cables satisfy the requirements of FCC socket NO. 20780 controlling (FEM) emissions. Step-by-step setup and protocol information is provided in the cable box for specific computer/printer combinations. Five year warranty. (List Price: \$44 to \$56 depending on printer used)
Computers Accessories Corporation
0343 Roselle St.
San Diego, CA 92121
(619) 450-0852

Layout Grid Paper

Punched-hole grid paper for use in loose-leaf binders. Paper has numbered columns and rows. Display/Programming grid paper is actual display size with an 80 by 25 square grid. Graphic Character Display Design grid paper has twenty 9 x 14 enlarged square grids. Printout design grids are offered in three configurations: 8 1/2 x 11 inch form size, 1/8 inch column, 1/8 inch row; and 8 1/2 x 11 inch form size, 1/8 inch column, 1/8 inch row. (List Price: Display/Programming or Graphic Character Display Design \$5 for 50 sheets, Printout Design \$7.50 for 50 sheets)

Christie Word Processing Service
P.O. Box 1004
Neptune, NJ 07753
(201) 922-1531

Ribbonizer

A machine that renews fabric ribbons by applying fresh matrix ink. Ribbons can be renewed repeatedly until the fabric wears out or the cartridge fails. A lowspeed motor moves the ribbon through ink rollers renewing the ribbon at a rate of 5 feet a minute. Models are designed for NEC, Epson, Diablo, Radio Shack, and Tally printers. Ink is also available separately when an additional supply is needed and is blended to the specifications of major ribbon suppliers. (List Price: \$39.95, one oz. bottle of ink \$1.95)

The Ribbonizer
P.O. Box 1727
Redlands, CA 92373

Perfect Data Series

Cleaning and maintenance products for disks or daisy wheel printers. The Perfect Data Model 400-PX for "Phoenix type" CMD disk cartridges allows users to verify critical mechanical tolerances, as well as to clean disk surfaces. Its solution and cleaning pads safely remove contamination from disks.

Also available is the Perfect Data Type Element Cleaning kit for keeping printer characters sharp and smudge-free. It consists of cleaning unit, pad, and bottle of solution providing approximately 25 applications. (List Price: 400-PX \$3.495; type element cleaning kit \$19.95)
Innovative Computer Products
18360 Oxnord St.
Tarzana, CA 91356
(213) 996-4911

Nylon Replacement Cartridge Ribbons

Cartridge ribbons for Anadex 9500 series printers which come in black, blue, brown, red, and green. The snap-in plastic cartridges have 30 yards of 1/8-inch nylon ribbon. (List Price: \$13 black, \$15 colors)
Aspen Ribbons, Inc.
1700 N. 55th St.
Boulder, CO 80301
(303) 444-4054
Telex: 45-0055

Printer Cables. Computers Accessories Corporation



Index To Advertisers

READER SERVICE NO.	ADVERTISERS	PAGE	READER SERVICE NO.	ADVERTISERS	PAGE	READER SERVICE NO.	ADVERTISERS	PAGE
101	ABacus Associates Inc.	385	137	Bard Software Publisher	419	191	Computer Workshop	3
134	ABM, Inc.	153	138	BASF Systems	132	179	Computerworld International	2
135	Access Unlimited	79	142	BCC, Inc.	384	185	Conographic	3
102	ADT	87	144	Beaman Porter	181	198	Consultant Systems, Inc.	3
103	Advanced Computer Products	301	145	Bella Computer	98	197	Continental Software	3
104	Aegis Systems	388	146	Berzirk Systems	379	198	Contract Services Associates	3
105	Aerocomp	254	147	Best Programs	361	165	Control Systems	2
106	Affordable Software	381	148	BHRT Inc.	386	200	Coolool	2
107	Affordable Software	290	150	Blaise Computing Inc.	360	201	Corona Data Systems	2
108	Affordable Software	338	151	Bodnar Associates, Inc.	224	202	Cortland Data Systems	2
109	Alpha Byte	100	152	Bottom Line, The	192-193	205	Covers-A-Lot	3
110	Alpha Byte	57	153	BT Enterprises	298	208	Creativity Unlimited	3
111	Alphanetics	173	154	Busi Math Corp.	282	479	C-Systems	3
112	Alpha Software	Cover 2	155	Business Managers	27	172	CTI	2
139	Alpha Software	3	155	Business Master	400	206	Curtis Manufacturing	2
113	Alta Systems, Inc.	378	157	Business & Professional Software	60	207	Cybernetics	2
114	Amdek	141		Cab-Tek	381	175	Cybersoft	4
115	American Small Business Computers	260	140	Cactus Technology, Inc.	212	208	Cypher	3
118	American Training International	4		California Micro Computer	387	475	DataCase	3
141	Anatron Inc.	92-93	158	Camrass Corporation	382	213	Data Consulting Group	3
117	Ann Arbor Software Associates	201	159	Care Computer System	379	188	Data Display	2
118	Apparat	214		* CDEX Corporation	229	215	Detamost	1
119	Application Techniques	102	163	Checks-To-Go	334	217	Data Source Systems	3
120	Applied Computer Products	451	164	Chrislin Industries	247	218	Detatek	1
121	Applied Creative Technology, Inc.	35	166	Colby Computer	235	143	Data Translation	3
122	Applied Software Technology	218	167	Colorcorp	13	219	Davong Systems, Inc.	3
123	Apstek, Inc.	237	168	Columbia Data Products	206	220	DB/DC Software Associates	3
124	Archives, Inc.	305	160	Columbia National General Agency	259	221	Decision Resources	2
125	Arlington Software Systems	357	161	Comnet	350	222	DGM Corp.	3
128	Armonk Corp.	374	189	Comprehensive Software Support	12	223	Diamond Software	1
127	Arrix Logic	268	170	Compusad	191	223	Diamond Software	1
128	Artificial Intelligence Research Group	383	382	Compushack	368, 369	477	Digisoft, Inc.	3
129	Ashton-Tate	284-285	173	Computech Group Inc.	358	224	Digital Marketing	3
130	Aspen Software Co., Inc.		174	Computer Biz	256	209	Don-El Computer Products	3
	Ditronics Publishers	378	178	Computer Case Co.	389	232	Duncan Atwell Computerized Tech.	1
131	Aspen Software Co., Inc.		178	Computer Control	487	171	Eastern Enterprises	2
	Ditronics Publishers	383	180	Computer Exchange	43	235	E.D.S. (Electronic Data Systems)	3
133	ASTEC	188	181	Computer Innovations, Inc.	219	238	Electronics Specialists	3
132	AST Research	82-85	192	Computerized Data Management	459	234	800 Software	3
494	Atsuko Computing International	360	182	Computerline	313	237	Emerging Technologies Consultants	1
	Austin Data Management	408	183	Computer Mail Order	296	233	ERAS	3
149	Automated Information Management	390	184	Computer-Mete, Inc.	286	240	E-Z Tax	2
136	Banbury Books	325	186	Computer Outlet	355	462	Fast N Fun	2
			185	Computer Peripheral Systems	145	241	* Financial Software	3
			188	Computer System Design	360	241	Financier Inc.	1
			189	Computer Toolbox	378	243	1st National Computers	3
			190	Computer Wise	396	244	Flagstaff Engineering	4
						245	Floppy Disk Services	2
						238	Fogle Computing Company	3

READER SERVICE NO.	ADVERTISERS	PAGE	READER SERVICE NO.	ADVERTISERS	PAGE	READER SERVICE NO.	ADVERTISERS	PAGE
39	Fourth Technology.....	238	296	Lighthouse Distributing.....	242	332	Owl Software Corp.....	446
42	47th St. Computer.....	174	301	Maxima.....	65		Pacific Data Systems.....	119-120
44	Fox & Geller.....	227	302	Maynard Electronics.....	381	353	Pacific Data Systems.....	121
49	Frederick Computer.....	328	311	MBL.....	80-81	354	Payless Tex II Inc.....	202
60	FTG Data Systems.....	277	*	MBSI.....	5	355	PBL Corp.....	371
	Funk Software.....	252	298	Medi Soft.....	390	324	PC Clearing House.....	68-69
63	Futra Company.....	378	304	Med Systems Software.....	392	358	PC Connection.....	241
64	FYI, Inc.....	232	306	Memory Technologies Inc.....	133	499	PC Connection.....	425
65	Genie Computer Corp.....	34	308	Metasoft.....	170	357	PC Expo.....	20
67	Graphic Software.....	405	497	Metro Computing.....	209	325	PC Software.....	52
60	H&E Computronics.....	29	495	Microcom.....	28	335	PC Software.....	197
68	Hauptpaug Computer Works.....	98	309	Micro Computer Sales.....	388	359	PC Software.....	453
61	Hercules Computer Technology.....	37	312	Micro-Computer Taxsystems Inc.....	222	358	PC Software, Inc.....	479
*	Hewlett Packard Corp.....	273	315	Micro Flash.....	383	360	PCEZ Software.....	278
62	Howard Sams.....	114-115	489	Micrografx.....	380	361	PCX.....	240
63	Howard Sams.....	71	316	Micro Grip Ltd.....	388	383	Performance Engineered Programming.....	489
	Howard Software.....	87	317	Microhouse.....	10-11	364	Periphex Inc.....	288
66	Howe Software.....	391	*	Micro Investment Software.....	304	365	Persoft Inc.....	382
67	HRCOM International.....	172	319	Micromart.....	72-73	372	Personal Computer Software Specialists.....	387
68	IB Megazette.....	449	320	Micro Match.....	364	367	Persyst.....	128
69	IBM.....	23	321	Micro-Q.....	253		Phaser systems.....	49-50
70	I-BUS Systems, Inc.....	297	*	Micro Soft, Inc.....	1, 148-149	377	Phaser Systems Inc.....	51
71	ICR Future Soft.....	46	326	Microstuf Inc.....	99	366	Physical Sciences Inc. (PSI).....	354
73	IDE Corp.....	302	327	Micro Synergy, Inc.....	225	368	Platronics/Fredricks.....	323
74	Indigo Data Systems, Inc.....	33	328	MicroTeure.....	198	369	Pop Com, Inc.....	388
*	Individual Software Inc.....	207	329	Microtechnical Products.....	370	370	Practical Peripherals, Inc.....	47
75	Info Devices.....	178	331	Microware.....	402	379	Princeton Graphics Systems.....	299
77	Inner Loop Software.....	389	332	Miller Microcomputer Service.....	218	371	Prism Products/Kal.....	245
72	Innosys Inc.....	423	338	M.I.S. Consultants.....	38	373	Professional Microsystems.....	185
78	Innovative Software.....	238	333	MK Research.....	385	374	Professional Software Inc.....	24-25
78	Integral Data Systems.....	190	334	Morgan Computing Corp.....	351	375	Programming International.....	385
79	Intek.....	182	336	MPPI.....	387	378	Pure Data Ltd.....	166-187
85	Intersoft.....	159	*	MRM Enterprises.....	379	380	Pyxel.....	223
82	Intersoft.....	156-157	339	Nat Hellman III, Inc.....	168	382	Quedram Corp.....	16-17
84	Ipx International, Inc.....	382	340	National Computer Shows —PC '83.....	128-129	381	Quedram Corp.....	40-41
78	Ironsides Computing Corp.....	385	342	NEC Information Systems, Inc.....	134	383	Quale.....	251
28	ISE.....	58	343	Network Consulting, Inc.....	249	384	Qubie Distributing, Inc.....	257
85	IUS (Information Unlimited Software).....	124-125	344	N.F. Systems Ltd.....	183	385	Qubie Distributing, Inc.....	142
93	Jock Strick & Associates.....	381	341	Norell Data Systems.....	337	491	QuCeS, Inc.....	258
87	Johnson Associates Software.....	282	348	Norton Utilities.....	457	492	QuCeS, Inc.....	318
88	Kaljo Electronics Co., Inc.....	382	345	Novell.....	39	388	Quest Research, Inc.....	377
86	Dynax (A Division of Kanematsu-Gosho).....	230	347	Omega Microware, Inc.....	191	493	Radio Technology.....	248
90	Laboratory Microsystems.....	309	348	Omicron.....	345	387	Reed-Ware Systems.....	228
91	Lang Systems.....	108	350	Omic Corp.....	386	368	Realia, Inc.....	388
92	Leading Edge.....	Cover 3	323	Open Systems Inc.....	250	389	Red Baron Computer.....	241
90	Leading Edge.....	204	349	Orion Software.....	48	412	Redgate Publishing.....	415
81	Leading Edge.....	205	490	Orthosoft—Roseware Systems.....	328	390	Retail Solutions.....	332
93	Lexisoft.....	329	351	Oryx Software.....	181	391	RGB Designs.....	385
95	Lifetree Software Inc.....	353				488	Robert J. Brady.....	291
						392	R.T.C.S. Corp. (Real Time).....	377

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393	Santa Clara Systems.....	131	421	Spectrum Software.....	413	450	Tecmar Inc.....	
394	Satellite Software, Inc.....	246	*	Spinnaker Software.....	14-15	451	Tecmar Inc.....	Cove
395	Saturn Systems Inc.....	118	422	Squire Buresh Associates, Inc.....	385	452	Tecmar Inc.....	
396	Savant Software.....	310	423	SRA Inc.....	348	449	Texasoft.....	4
397	Sciter Corp.....	150	424	SSR Corp.....	391	456	Ticom Systems, Inc.....	3
398	Seattle Computer.....	294	425	Standard Software.....	226	299	T.K. Engineering.....	2
401	Sigma Designs.....	421	*	Stansbury.....	340	457	Tokyo Electronics.....	1
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414	Software Publishing (PFS).....	314-315	436	Symmetric Software.....	252	473	Watsoft Products.....	3
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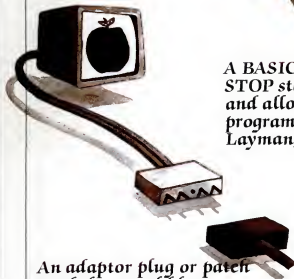
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A BASIC utility that would insert STOP statements between all the lines and allow users to step through their programs one line at a time. John R. Layman, Columbus OH



An adaptor plug or patch cord that would let non-IBM monitors plug into the AC power outlet at the rear of the system unit. Frank S. Gall, Chicago IL



A light on the chassis to indicate whether the computer is turned on or off. Sarah D. Patek, South Salem NY

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